A FAWCETT PUBLICATION

# 0¢ MECHANIX ILLUSTRATED

SEPTEMBER
NSC

(Reg. U. S. Pat. Off.)

THE AIRACOBRA GETS ITS TEETH • SEE PAGE 87

## MAJOR A. P. de SEVERSKY FORECASTS—

## THE AIRPLANE OF TOMORROW

## . . . AND INDUSTRIAL WARFARE HAS ITS "COMMANDOS," TOO!

ON THE battlefield, daring "hit-and-skip" raids can only succeed when every man is *trained* to do his part to perfection.

Industrial warfare, too, has its "commandos"—workers whose skill and experience are backed by sound, practical, up-to-the-minute *training!* These are the men who were Johnny-on-the-spot when the nation called on industry to outproduce the Axis!

Many of these "shop commandos" got their basic and specialized training through the International Correspondence Schools—at surprisingly low cost! It's not too late for YOU to join their ranks—by starting now to get the training that will make you a better soldier on the industrial front, and qualify you for a more responsible, better paid job!

Simply mail the coupon, and we will send you complete information on I. C. S. Courses in your line of work.

**NOTICE!** *Please show this advertisement to your friends. Even if you have mailed the coupon, they can get prompt information by mailing a postcard or letter, telling their name, age, address and occupation, to* **Box 2325-Y,**

**INTERNATIONAL CORRESPONDENCE SCHOOLS, SCRANTON, PENNA.**

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Diesel Engines
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Commercial Illustrating
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*Present Position* _____

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SEPTEMBER 1942

# MECHANIX ILLUSTRATED

VOL. XXVIII NO. 5

W. H. FAWCETT, Jr., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Norman C. Lipton, *Photography;* Charles D. Bonsted, *News;* Shirley Cutter, *Production*

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## SPECIAL FEATURES

*On the cover: Lieut. Earl E. Bates, Jr., takes his pilot's seat in an Army Bell P-39 interceptor-pursuit plane, best known as the death-dealing Aircobra, while armorers finish loading its .30- and .50-caliber machine guns.*

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Will your first big peacetime purchase probably be an automobile? Do you know it's likely to have a colorful plastic body that won't dent or scratch, an upper portion like a plane-gunner's unfogging "blister," a diesel or a direct-injection type engine, springs that will enable you to travel over rough terrain like a wartank but more comfortably? These and other features of the next autos are revealed in October in the second article in MECHANIX ILLUSTRATED's fascinating series on the post-war era's promise, "A World You Never Knew," by Donald G. Cooley. Major de Seversky's forecast on "The Plane of Tomorrow" in this issue is the brilliant opener for these revelations which scoop your daily newspaper. Don't miss a single one!

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# I jumped from $18 a week to $50
## -- a Free Book started me toward this
# GOOD PAY IN RADIO

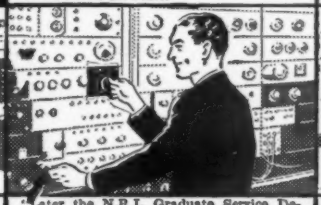
## Here's how I did it

by S. J. E.
(NAME AND ADDRESS SENT UPON REQUEST)

"I had an $18 a week job in a shoe factory, but desired to make more money and continue my education. I read about Radio opportunities and enrolled with the National Radio Institute."

"The instruction I received was so practical I was soon able to earn $5 to $10 a week in spare time servicing Radios. This paid for the N.R.I. Course and led to service work paying for my college education."

"Radio servicing permitted me to attend school and work evenings and week-ends. Upon completing the N.R.I. Course I was made Service Manager at $40 to $50 a week, more than twice my shoe factory wage."



"Later the N.R.I. Graduate Service Department sent me to Station KWCR as a Radio Operator. Now I am Radio Engineer of Station WSUI and connected with Television Station W9XK."

"The N.R.I. Course took me out of a low-pay shoe factory job and put me into Radio at good pay; enabled me to earn funds for a college education. There's a promising future for thoroughly trained Radio men."

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**National Radio Institute**
**Established 27 Years**

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### Beginners Quickly Learn to Earn $5, $10 a Week Extra in Spare Time

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**EXTRA PAY IN ARMY, NAVY, TOO**

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**THIS FREE BOOK HAS SHOWN HUNDREDS HOW TO MAKE GOOD MONEY**

J. E. Smith, President, Dept. 2JH
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Mail me FREE, without obligation, your 64-page book, "Rich Rewards in Radio." (No salesman will call. Write plainly.)

Name..... Age.....

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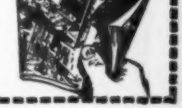

# Do you want

→ ..to go to College?

→ ..or to enter a Profession?

*(Such as Accounting, Architecture, Nursing, Dentistry, Teaching, Social Work, Osteopathy, Beauty Culture, Optometry, Embalming, Chiropody, Law, Medicine, etc.)*

→ ..or get an Office Position?

To get anywhere, you practically MUST finish High School FIRST. You can complete our simplified High School Course in SPARE time at home, as FAST as your time and abilities permit. Equivalent to resident school work—prepares you for college, pre-professional examinations, business, industry. Standard texts furnished. Diploma. Credit for H.S. subjects already completed. Single subjects if desired. Low tuition, easy terms. American School, Chicago, est. 1897—endorsed by educators. Finish your high school education NOW. Write TODAY!

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# The 97 Pound Weakling

*—Who became "The World's Most Perfectly Developed Man"*

## "I'll prove that YOU, too, can be a NEW MAN!"

*Charles Atlas*

CHARLES ATLAS
Holder of Title, "The World's Most Perfectly Developed Man."

I KNOW, myself, what it means to have the kind of body that people pity! Of course, you wouldn't know it to look at me now, but I was once a skinny weakling who weighed only 97 lbs.! I was ashamed to strip for sports or undress for a swim. I was such a poor specimen of physical development that I was constantly self-conscious and embarrassed. And I felt only HALF-ALIVE.

Then I discovered *"Dynamic Tension."* It gave me a body that won for me the title "World's Most Perfectly Developed Man."

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Do you want big, broad shoulders—a fine, powerful chest — biceps like steel — arms and legs rippling with muscular strength — a stomach ridged with bands of sinewy muscle—and a build that you can be proud of? Then just give me the opportunity to prove that *"Dynamic Tension"* is what you need.

No "ifs," "ands," or "maybes." Just tell me where you want handsome, powerful muscles. Are you fat and flabby? Or skinny and gawky? Are you short-winded, pepless? Do you hold back and let others walk off with the prettiest girls, best jobs, etc.? Then write for details about *"Dynamic Tension"* and learn how I can make you a healthy, confident, powerful HE-MAN.

*"Dynamic Tension"* is an entirely NATURAL method. Only 15 minutes of your spare time daily is enough to show amazing results — and it's actually fun! *"Dynamic Tension"* does the work.

## Send for FREE BOOK

Mail the coupon right now for full details and I'll send you my illustrated book, "Everlasting Health and Strength." Tells all about my *"Dynamic Tension"* method. Shows actual photos of men I've made into Atlas Champions. It's a valuable book! And it's FREE. Send for your copy today. Mail the coupon to me personally. CHARLES ATLAS, Dept. 6-Y, 115 East 23rd St., New York, N. Y.

**CHARLES ATLAS, Dept. 6-Y,**
**115 East 23rd Street, New York, N. Y.**

I want the proof that your system of *"Dynamic Tension"* will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength."

Name.....
*(Please print or write plainly)*

Address.....

City.....State.....

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**WE HAVE** long been the greatest mechanically talented nation on earth. And war industry is increasing the competition among skilled workers. Take filing. New hands are becoming adept in the use of files. Older ones are obtaining still more efficient filing results.

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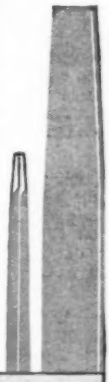
**NICHOLSON FILE CO.,** Providence, R. I., U. S. A.
*(Also Canadian Plant, Port Hope, Ont.)*



**NICHOLSON FILES** *FOR EVERY PURPOSE*

NICHOLSON U.S.A. MADE IN U. S. A.

***Twelve perfect files in every dozen*** is the sweeping Nicholson guarantee. Your hardware or mill-supply house is the place to get them.

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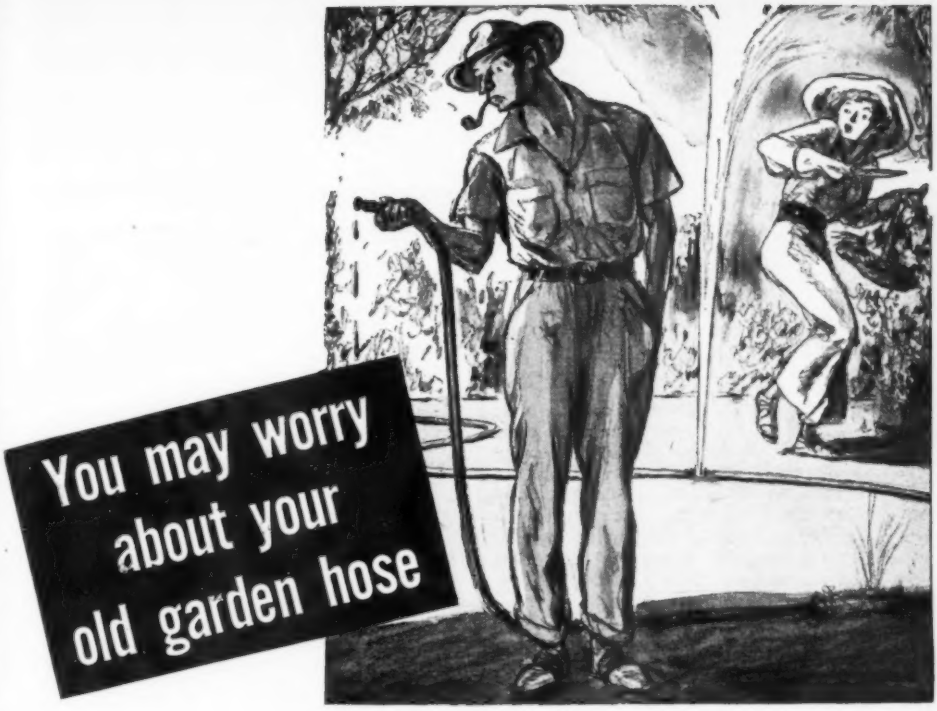


## ...but here is one worry you can avoid

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# NEW PRODUCTS AND INVENTIONS

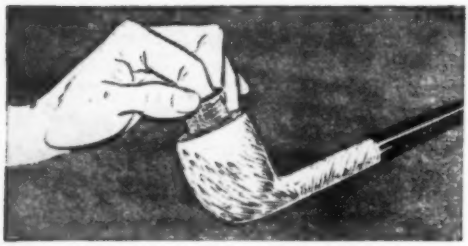
LATEST HOME AND SHOP DEVICES • POPULAR PATENT IDEAS

## GOSSIP OF DEFENSE AND INVENTORS

by Morton Leese

WHEN Eli Whitney obtained his cotton ginning patents in 1794 he obtained the right to sue infringers. Unfortunately his juries were usually made up of cotton planters with decisions that might be expected. The story is told that in one suit the defendant was urging that neither Whitney's gin nor any copy of the gin had operated in the state of Georgia. A juryman complained that there was so much noise outside the courthouse that he could not hear a word the lawyer for the defendant was saying. The sergeant-at-arms was sent out to stop the noise. The sergeant returned with the information that one cotton gin was operating on each side of the court house, and one across the street, and that the ginners refused to stop the noise. And even that case Whitney lost.

### New Products



Designed to add to the pipe-smoker's enjoyment, a flexible filter *(above)* is inserted in the bowl to keep the pipe dry and act like a wick, carrying harsh and bitter juices to the combustion zone in the pipe bowl where they are burned off. The filter also keeps the pipe from clogging by straining the smoke through the glass yarn which makes it. The maker claims this filter eliminates the necessity for breaking-in a pipe because it helps build up a sweet, even cake; insulates and cools the bowl; and eliminates constant pipe cleaning. One of these filters is said to be good for 200 smokes.

* * *

A very simple invention is the circular typewriter eraser with a hole in the center to permit the eraser to be tied to the machine. It is reputed to have yielded a fortune to its inventor.

These writing cards are designed to make it as simple as possible for the boys in camp to write home. The cards come in a book of 32, contained in a self-mailing carton which has space provided for stamps and address. Four and one-half cents postage will send it anywhere in the world where postal service is maintained. No additional wrapping is necessary.

* * *

An application for a patent should not contain more than one invention. If a number of inventions are claimed, the Examiner will require you to elect one invention. Patents on the other inventions would have to be based upon separate applications. In each case you will be required to limit a description, drawing, and claim to whichever invention you may elect.

Should you decide to remove part of your application to file a later separate application, then the first application should not contain a reservation for the future application on subject matter disclosed but not claimed. However, it may be advisable to file the second or divisional case before the subject matter is removed from the first case. This is to prevent a later possible holding that by cancelling the subject matter without filing a second case you abandoned the second invention.

* * *

A new method in applying paint to wall stencils has been worked out. Paint is poured on a sponge rubber pad, as shown in the top photo. Then a special roller-brush device having two heavily-covered plush rollers which quickly absorb paint, is put into use. As shown in the lower photo, the first roller is touched to the paint while the second is used for spreading the paint on the stencil. The method is said to be neater and less wasteful than the old method of daubing wall stencils with a brush that's been dipped in paint. Eliminated are anxiety about paint running in back of the stencil, and getting the brush too heavy with paint.

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# Chips FROM THE Editor's Workbench

### *A World You Never Knew*

HAD you ever stopped to think what the world is going to be like when our enemies are finally beaten and Peace finally comes?

Major Alexander P. de Seversky's intriguing article forecasting "The Airplane of Tomorrow" (see page 40) made us stop and think. As you will discover by reading Major de Seversky's masterpiece, there are changes coming in airplane design that are revolutionary, to say the least. As the Major says, "Science makes more progress in one year of war than in a decade of peace." The war is *forcing* us to make tremendous strides in airplane design. We *must* do it, to win.

W. O. Holton, 27-year-old Dallas, Tex., resident who won the great MI Words-Within-Words contest, receives the first prize plane from Roy R. Taylor, Aeronca district representative.

Granted the war is perfecting the airplane. Then what about other lines of science?

What about the automobile, for instance? We called in Donald G. Cooley, one of America's outstanding scientific writers, and asked him to find out for us what was going on in the world of the automobile.

Mr. Cooley came back with an amazing report. Before the war, he learned, each new model of an automobile that came out, from year to year, was about 75 per cent "hang-over" from the previous year's models. The 1942 model, for instance, contained many features of the 1941 model. The reason for this was simple. The manufacturers had a tremendous investment tied up in dies and tools. Consequently, they tried to use as many of the previous year's dies and tools as possible in producing a new model.

But here's the significant thing that Mr. Cooley discovered: Now the motor industry has been converted almost 100 per cent to war production —and as a result *practically all of the old automotive dies have either been junked or become obsolete!*

So, what is going to happen? The answer is clear. When peace comes, the automotive industry is going to start from *scratch!* They're going to come out with designs that will be like something out of the world of dreams! And these designs are going to incorporate all the *tremendous* progress that the automobile manufacturers have made in research stemming out of their war effort!

Mr. Cooley got together such an astounding array of new facts about improvements made in the automotive field that we could hardly believe them all. But his facts are backed up by quotes from leaders of industry that *force* you to believe them.

Mr. Cooley's article, "What Your First Peacetime Automobile Will Look Like," is going to appear in the next issue of MECHANIX ILLUSTRATED (October, on your news stand September 4). We think you will agree, when you read it, that it's about the most interesting and sensational story you've ever read.

But that's only a start! We asked Mr. Cooley, "If these facts are true about automobiles, then aren't they also true about almost everything else we use in our daily life?"

Mr. Cooley did some more investigating. His answer was, "Yes! Decidedly, yes!" Mr. Cooley

## Editor's Workbench Chips

discovered that the most amazing revolutions are occurring, as a result of wartime research, in the whole field of industry and manufacture. Your new home after the war, for example, is going to be something entirely different from anything you have ever seen—as a result of innovations turned up in the great surge of present research. Heating systems, methods of prefabrication, paints, glass, plastics, lighting systems—they're all going to be *entirely different* in your home after the war!

Then, too, refrigerators, radios, kitchen equipment—almost everything you use in your daily life—are all going to be vastly improved and greatly changed.

The food you eat (as a result of the Army's present experiments in nutrition), the containers your food comes in, the medicines you use, the clothing you wear—they're all going to be new.

As a result of all of these amazing discoveries coming out of the war, when peace finally comes you're going to step into a new world—a world you never knew.

And that's the name of the series we have had Mr. Cooley write for you: "A World You Never Knew!"

Mr. Cooley's series will lead off with his article

IT GLIDES!

The sleek monoplane glider shown in the photographs above and below is the *Cloud Clipper*, built by Mr. Clarence B. Richards, of Cadott, Wisconsin. Mr. Richards writes that he spent about $85 on his glider, although present day restrictions on some materials made it necessary for him to use substitutes for some of the parts. He also made his own hinges. The original plans and instructions for building *Cloud Clipper* ran in FLYING MANUAL No. 6, available at 50 cents from Fawcett Publications, Inc., Greenwich, Conn. Blueprints are also available at $4.00 from the same address. This beautiful looking ship is still being tested by its owner, in "hedge hopping" fashion. It brings him this month's Workbench first award of $5.00, and a Certificate of Merit for the wall of his workshop.

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# Editor's Workbench Chips

on your first peacetime automobile. This article will be followed in succeeding issues by others forecasting and picturing for you the "World You Never Knew" which is coming with peace.

We think it's one of the greatest stories ever written. We think, too, that it is going, in the present time of war, to give America something additional *to fight for!* For when you have finished this series, you will have a vision of a new America—an America all the more worth fighting and sacrificing, sweating and bleeding to attain!

Please don't fail to get your October MECHANIX ILLUSTRATED to start this series—"A World You Never Knew!"

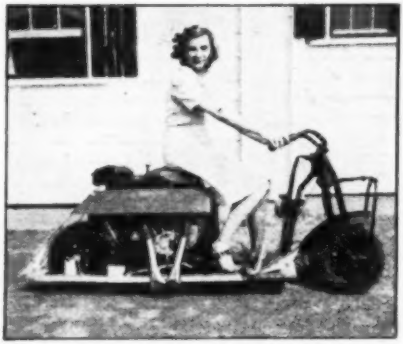
### *Major Prophet*

MECHANIX ILLUSTRATED is highly honored this month to have one of America's greatest writers as one of its contributors. We speak, of course, of Major Alexander P. de Seversky. His book, "Victory Through Air Power" (Simon & Schuster, $2.50), is currently on all of the best-seller lists in America. As a result of this book, Major de Seversky has been generally recognized as the new prophet of Air Power in military strategy, and the United Nations air attack upon Nazi Germany is following the de Seversky plan of assault in detail. We strongly recommend the book as *must* reading.

We've told you a little something about Major de Seversky on page 44 of this issue. However, our space there is really too limited to do him justice.

Major de Seversky, aside from being famed for

SUPER SPEED SCOOTER



Authur Renaud, U.S.N., of 128 B Lexington St., Newport, R. I., The Anchorages, built the fast scooter that the young lady is seated on in the picture above. Its 10 h.p. motor and 3-speed transmission give it a speed of 55 miles an hour according to Mr. Renaud—and that's real speed for a scooter. But 10 h.p. is plenty of power, too. By coincidence, the scooter also gets about 55 miles to the gallon of gas. A $3.00 Workbench award and a Certificate of Merit go to Mr. Renaud for this snapshot of his speedy and economical scooter.

# Editor's Workbench Chips

his technical abilities, is one of the most romantic figures in the world today. His life story reads like something out of a novel. Born in Russia (he became a citizen of the United States in 1926), de Seversky was graduated from the Imperial Naval Academy and took one of the first courses in military aeronautics given anywhere in the world. As a result of his training, he became one of the earliest combat fliers in history, joining the Second Bombing Squadron Baltic Sea Naval Air Service, in Russia in 1914.

On July 2, 1915, during a bombing expedition in the Gulf of Riga, de Seversky's plane was shot down. His observer was killed and de Seversky lost a leg. In the spring of 1916, by special permission of Czar Nicholas II, de Seversky was permitted to re-enter the flying service, in spite of his artificial limb. From then until the end of the war, he was constantly engaged against German sea, air and land forces. He engaged in the earliest bombing raids, some of which consisted of flying over the enemy and dropping bombs and grenades overside by hand!

For his activities, he was awarded a Gold Sword by the Czar.

After the war, he came to America. He was soon commissioned in the U. S. Army Air Corps. Then he began to pile up an unequalled record of achievement in aviation. He designed and patented landing gear for seaplanes and flying boats. He devised a method of hunting submarines by airplane. He was appointed Consulting Engineer

LAWN CHAIR FROM MI PLANS

Ben C. Moseley, of 25 W. Broad St., Newnan, Ga., built this attractive lawn chair from MI plans. His mother is shown seated in it. The total cost of the chair including the enamel, was about $2.50. Ben tells us. The $3.00 Workbench award that this snapshot brings Mr. Moseley would more than cover the cost of another chair at that rate. Mr. Moseley also receives a Certificate of Merit.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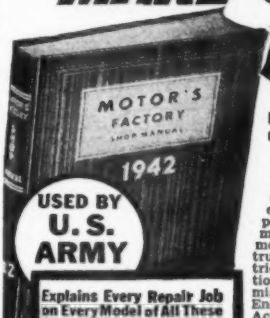


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# Editor's Workbench Chips

for the United States Air Service by the Secretary of War. In that capacity, he invented an automatic bombsight, for which the United States paid him $50,000.00.

Major de Seversky has organized and headed two great aircraft companies. He designed the famous BT-8 training plane, a number of U. S. Army pursuit planes and designed and flew amphibian planes which won the world speed record for such type of craft. His designs, improvements and patents take a full page to list. He is perhaps best known for designing the famous P-35 pursuit, out of which the new P-47 "Thunderbolt" was developed.

In 1939, he was awarded the Harmon Trophy as America's outstanding aviator.

Incidentally, Walt Disney, creator of "Mickey Mouse," has bought the movie rights to "Victory Through Air Power," and soon you will be seeing a Disney animated film picturing the great principles of military strategy laid down by Major de Seversky. Don't be surprised if you see "future" airplanes in the Disney film taken from the illustrations of the de Seversky article in this issue of MECHANIX ILLUSTRATED.

## *Tally-Ho!*

YOU who are about to take up the gentle art of hunting, or already-experienced sportsmen looking for new fire power—be sure not to miss the article entitled "How To Buy a Used Gun" on page 108. It was written by Philip Sharpe, who is somewhat of an authority on ordnance matters, and tells you how to go about getting a second-hand gun that won't need expensive repairs after one firing, or worse still, blow *you* to smithereens instead of the quarry. We know you'd rather have a new gun, but unfortunately such foibles are out for the duration; don't worry though, for under Mr. Sharpe's able guidance you'll get one as good

2 YEARS OLD AND TROUBLE-FREE

Samuel G. Porter, of Andover, O., RD No. 1, is the builder of this tractor. It has an all-welded frame, Model A Ford front axle pivoted in the center, Model A Ford motor, and a Graham radiator. The rear wheels have bus tires, and the front ones are regular Ford V-8 wheels. Mr. Porter's wife is shown at the controls of the tractor, which has been in use 2 years without trouble. This snapshot brings Mr. Porter a $3.00 Workbench award and a Certificate of Merit.

# Editor's Workbench Chips

as new . . . we hope. All this reminds us of a little "hunting" story told to us recently by a friend with a very long bow, and if you'll read on we think you'll agree that it was worth repeating, quote:

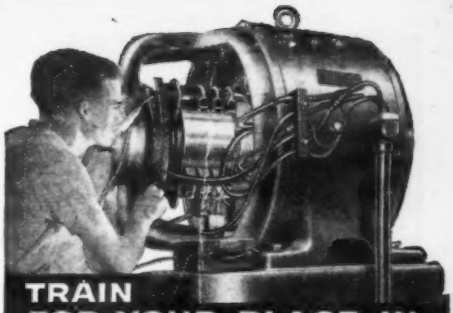
"I remember an occasion on the way home with only one cartridge left in my revolver and my partner all out of ammunition. I saw a little movement on the other side of a barbed wire fence, stopped the car, looked down and saw a rattlesnake all coiled up ready for business—he was a rattling big snake. At the same time my partner looked out in the field and saw a crow and asked me to shoot the crow. Could never resist the temptation to shoot a rattlesnake, so to please my friend and also get what I wanted I fired the .38 bullet into the barbed wire, splitting the bullet. One part of the bullet went down through the snake's head and the other part of the bullet sailed out into the field and knocked over the crow. However, when I went out to pick up the crow I found he was only stunned for that morning I had two cups of coffee so was a little bit shaky so instead of hitting the crow on the head as I intended, I only shot his bill off. I did pity that poor crow and took him home and as this was only the tenth of the month I fed him with an eye dropper as you know new bills are never sent out until the first of the month so you see the crow caused me quite a little trouble, but he's all right now." . . . O.K., go ahead and cancel your subscription and see if we care.

### *Get Into The Scrap*

LAST month we told you the translation of specific amounts of metal junk in terms of weapons, remember? Since then you've probably

BUILT FOR ABOUT $35

John Lapinsky, of 86-20 107th Avenue, Ozone Park, L. I., N. Y., is the builder of this sailing canoe. He combined some of the features contained in plans in HOW TO BUILD 20 BOATS with other ideas in building it. It took John and his brother exactly 3 months to complete the entire job, and cost them about $35. This snapshot brings Mr. Lapinsky a $3.00 Workbench award and a Certificate of Merit.

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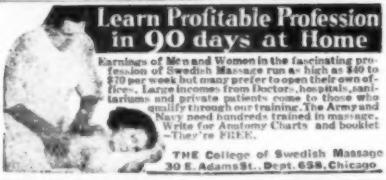
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(pages27-30)

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# Editor's Workbench Chips

seen scales interpreting the need for junked rubber, as vital to our war effort now as metals. Among the facts we've had called to our attention have been these: that a 50-foot length of your old leaky garden hose will furnish rubber equivalent to that in a Navy inflatable life raft such as you have seen illustrated in recent issues of MI. Also, two of the old tires lying in your garage equal one new tire for an Army jeep; and two old inner tubes add up to three heavy Army gas masks. Three discarded rubbers furnish enough reclaim for one Army overshoe. One hot water bottle has enough rubber for two yards of hospital sheeting.

Figures like these show how valuable your old rubber goods can be if they are sold or given to the government's drive. The reclaim made from this Victory rubber will not go by itself into Army products, but will be combined with other rubber in varying proportions. Reclaimed rubber is not the equivalent of crude in all applications but it can help out tremendously in the current shortage.

However, if some of those tires and tubes in your garage are not worn out but discarded because age had caused the rubber to turn hard, you may be interested as we were in learning of a brand-new liquid which has the amazing ability to rejuvenate rubber so old it's almost ready to crumble. A friend told us he'd seen it being applied at California filling stations to tires on cars that had been in storage as long as 20 years. The

## WASHING MACHINE TO MOTORBIKE

Kenneth Bruno, of 812 Florence Ave., Fort Wayne, Ind., built this motorbike, using the motor from an old washing machine. The bike frame is reinforced with iron rods to give the machine plenty of strength. The completed job weighs about 150 pounds and has a top speed of 22 miles an hour, according to the builder. This snapshot brings Mr. Bruno a $3.00 Workbench award and a Certificate of Merit.

# Editor's Workbench Chips

brittle tires and tubes snapped right back to freshness under the applications, he said.

Now all we need is a substance that will restore worn tires to their original size and wearing thickness!

### *Gourds to Filter Oil*

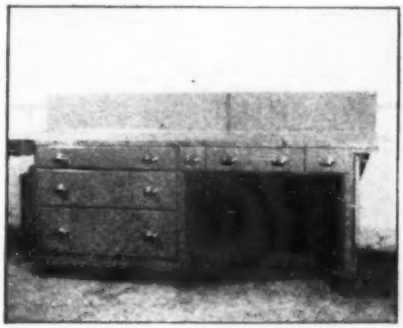
IT TAKES a war to bring about such an odd makeshift—successful, though—as a plant used as an oil filter on Navy ship engines. We'd never have believed such a thing possible until we read of it in a statement of information. Just shows you can expect anything these days, and that the era of surprise in the machine age is over even in details.

Here's the story: before the war sponges were imported from Japan in quantity for use as oil filters in the engines of ships. In attempting to find an answer to the lack, federal plant scientists discovered that the dishrag gourd, or loofah, contains a fibrous spongy material much like the animal sponge heretofore relied on. The dishrag gourd is one of the common gourds grown in dooryards throughout the South. The plant scientists rounded up seeds available and arranged for plantings this year in the United States on a scale less casual than dooryards.

Meanwhile, major supplies of the dishrag gourds have been obtained from Central and South American countries. Besides their test plantings here, the scientists are trying to learn best methods of growing and processing the gourd crop under commercial conditions. Can't you hear a farmer asking his neighbor, "How's your crop of oil filters sproutin', Elmer?"

Don't write the Department of Agriculture for

WORKBENCH AWARD FOR WORKBENCH



Benjamin V. Sundberg, of 171 Maplewood Street, Watertown, Mass., built this neat and rugged workbench from scrap material. The drawers are made from old packing cases, and the top of the bench from maple flooring. Old refrigerator cases provided other parts of the material. This picture brings Mr. Sundberg a $3.00 Workbench award and a Certificate of Merit.

## THIS SIGN HAS BEEN SCRAPPED!

If you are over 40, you know that this unwritten policy formerly faced you in many cases. Youth was preferred.

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# Editor's Workbench Chips

dishrag sponge seeds, though. All available supplies have been used.

## Fruit-Drying Plants Now Are Drying Vegetables

A hundred tons of cabbage a day, with similar mountainous quantities of onions, garlic and other vegetables, are being reduced to the bulk-saving, weight-saving dehydrated form in California processing plants formerly devoted to drying fruits, according to E. M. Chace of the U. S. Department of Agriculture.

When the procurement officers for American armed services and purchasers for the lend-lease program made known their huge-scale requirements for dehydrated vegetables, the first response was the conversion of the large fruit-drying plants. Some new establishments have also been set up.

Mr. Chace has warned against an over-enthusiastic rush to get into the food-dehydrating business, however. Several limiting factors impose themselves. Food dehydration is not the simplest job in the world, they agreed in declaring, and the number of men with adequate technical training is relatively small. Equipment also is a problem, because a certain amount of critical metal is needed for construction of a plant, as well as cutting and other processing machinery which may be difficult to obtain. Finally, despite the gargantuan requirements of Army, Navy and Lend-Lease, their buyers are not rushing into the market to grab up dehydrated foods no matter by whom offered.

IT RUNS WITHOUT GAS

Harold King, of 521 14th Avenue N.E., Calgary, Alberta, Canada, is the builder of this electric power scooter. Mr. King tells us that the machine can climb any hill in his town. Four auto batteries provide the current for a range of 40 miles. A recent check on the cost of re-charging the batteries indicates that the scooter travels about 400 miles at a cost of fifty cents, according to the builder. A $3.00 Workbench award and a Certificate of Merit go to Mr. King for this effective solution of the fuel shortage problem.

# Editor's Workbench Chips

## Anti-Scurvy Vitamin Prevents Heat Ills

Doses of vitamin C, the anti-scurvy vitamin found in citrus and other fruits, will prevent heat cramps and heat exhaustion, summertime menace to some persons but year-round danger to men working in steel mills, foundries, shipyards, in engine rooms of naval and transport ships and to troops in the tropics, industrial toxicology researchers have discovered.

Also proved effective in treating heat prostration when it does occur, vitamin C is soluble in water. Consequently even people eating a normal amount of it in their food each day may lose large amounts by sweating it out as salt is lost from the body with the sweat. Salt loss has long been recognized as a cause of heat cramps and heat prostration.

The vitamin is needed to maintain muscle tone both in the large muscles and in the small ones of the blood vessel walls. This tone, a slight but sustained contraction of healthy muscles occurring even when the body is at rest, is necessary to help move the blood in the veins back to the heart. In heat prostration there is a loss of tone and a consequent collapse of the circulation, aggravated by the dilation of the skin vessels in an effort to pipe more heat-laden blood to the surface to be cooled.

Success of the vitamin C pills in preventing heat cramps or exhaustion was obtained in a trial of their effect on 30 men who had to do a repair job on a "hot spot" over a drying cabinet up under the ceiling of a plant in the south.

These men were given two vitamin C tablets

BABY BUS HAS EVERYTHING

Robert M. Coe, of Stow, Ohio, built this beautiful 25¼-inch model bus. It's powered by a one-cylinder gasoline engine, and contains 15 tiny electric lights, plus 7 more on the outside. There are 3,500 rivets in the model, making it easy to understand why it took 2,160 working hours to build. Windows raise and lower, and are equipped with catches. In addition, the tiny passenger seats are neatly upholstered. This picture wins a $3.00 Workbench award. And of course, a Certificate of Merit goes to Mr. Coe for his workshop wall.

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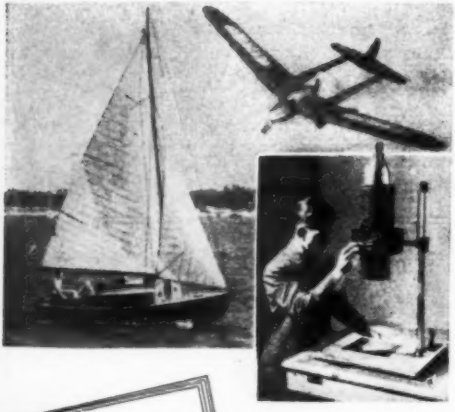

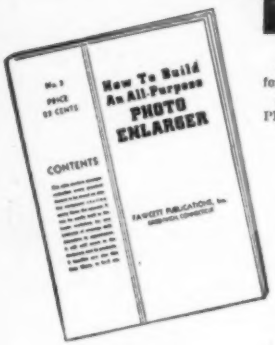


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# Editor's Workbench Chips

daily. Not a single man suffered either heat cramps or exhaustion during the entire job, which lasted several weeks at temperatures usually far above 100 degrees Fahrenheit and with very high humidity. After the job was finished the men reported feeling just as fit as they had when working at ordinary temperatures.

## Self-Refrigerating Foods

PERISHABLE foods are now being made to refrigerate themselves on American cargo ships, using an ingenious plan made public by the United States Department of Agriculture today. Lard, chilled to a zero temperature or lower, is the refrigerating agent. By lining the holds of ocean-going ships with insulating material, packing large containers of the refrigerated lard to form a floor and walls around perishable foodstuffs, placing more lard over the top, and adding a final cover of insulation, the shipment is kept safely cold until it reaches its destination in England or Russia.

The system has been adopted to keep Axis submarines from stopping shipment of perishables to United Nations ports by systematically sinking refrigerator ships. It has the added advantage of saving space which refrigerating machinery would occupy.

## Tinless "Tin" Cans Now In Production

The Great American Tin Can is rapidly learning how to get along on war-short rations on tin, or even to dispense with tin altogether. Complete tinlessness is attainable for certain containers by a process known as "bonderizing" the steel plate.

[*Continued on page* 24]

JOSEPH BRADLEY'S KINGFISHER

Joseph M. Bradley, of 85 F St., Carney's Point, N. J., is the owner and builder of this *Kingfisher*, plans of which appeared in HOW TO BUILD 20 BOATS. He has also built *Balboa* and used it for two years on Delaware Bay with much satisfaction. He has just launched *Kingfisher* this year. Mr. Bradley and his son are shown with the boat. Power for the new boat is provided by a Model A Ford motor. A $3.00 Workbench award and a Certificate of Merit go to Mr. Bradley for this snapshot of his excellent work.

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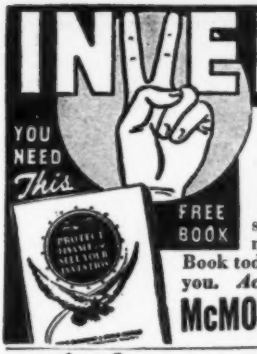


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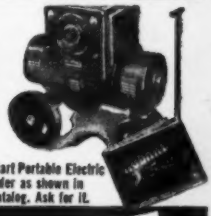

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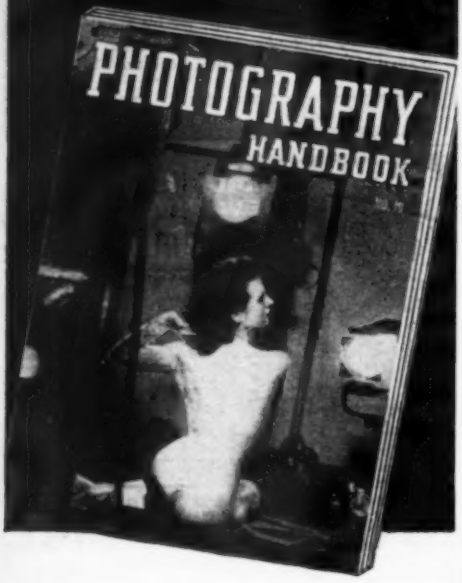


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## Editor's Workbench Chips

[*Continued from page 22*]

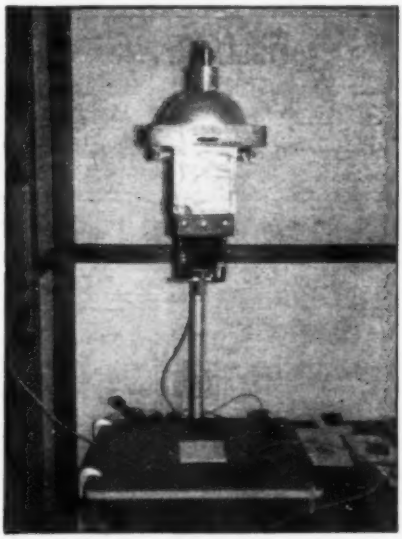
Not new, the process has been used in the auto industry several years.

Bonderized cans do not have high resistance to the acids usually present in canned goods, fruits and vegetables, but the treatment adapts the metal surface to the reception of protective plastic coating. Where tin is available, and necessary because of the nature of the can's intended contents, great economy can be effected by the relatively new electro-depositing method.

Paper, cardboard, cellulose sheeting are reserve troops in the Battle of the Containers, and they are valiantly taking over much of the job of tin, lost by capture to the enemy. Greater strength and lower loss of contents are sought by bonding together materials of different kinds, forming a laminated structure. Thus, an impervious cellulose sheeting may be bonded to a strong cardboard backing, to make a package that will take hard jolts and not leak.

## New Gunners' Sight Widens Firing Arc

A NEW telescope sight for the use of rear gunners on bombing planes, just patented here by Wolfgang B. Klemperer of Los Angeles, makes



Charles Hale, of 303 West Church, Americus, Ga., built this photo enlarger from the lens and bellows of an old Premo 4x5 camera, some water pipe, plywood, and several aluminum bowls. The plywood box under the lamp house contains slots for placing negatives at different distances from the lens. This gives a wide range of picture sizes. It looks like a very well made enlarger, and it brings Mr. Hale a $3.00 Workbench award and a Certificate of Merit.

## Editor's Workbench Chips

better streamlining of the fuselage possible and at the same time gives a wider arc of fire for the protection of what is now the most vulnerable of all points on a bomber—the rear.

At present, with his sights fixed rigidly on the gun, the gunner must move from side to side in order to fire in any direction other than dead astern. This necessitates making the tail gunner's position wide enough to let him slide back and forth, thereby producing a thick, lumpy tail instead of one tapered to a point as good aerodynamics requires.

In Mr. Klemperer's invention, a fairly wide-angeled fixed telescope is provided with a movable sighting reticule, so connected with the gun that the sighting cross-lines are on the target when the gun is in proper firing position. The gunner can therefore sight accurately by moving only the gun, and without needing to shift his position or sway his shoulders and head. To give a wider angle of fire, segments of the pointed tail are hinged to open like the petals of a flower just before firing.

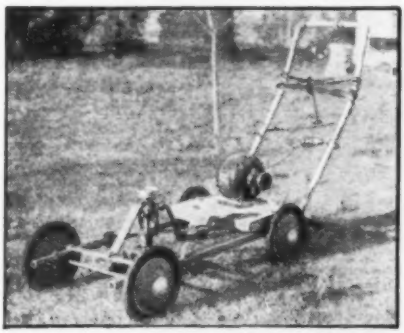
Rights in Mr. Klemperer's patent, No. 2,281,772, are assigned to the Douglas Aircraft Company.

## Baseball Really Does Curve, Physicist Proves

A BASEBALL really does curve and may deviate from a straight line as much as 6½ inches at the home plate, according to measure-

[*Continued on page* 31]

IT REALLY DOES THE WORK



**Reverend Walter Herrmann, of Saint Francis Church, Capuchin Fathers, Munior, Ellis Co., Kansas, built this modified version of MI's "Blitzkrieg Grass Cutter" and he writes, "Believe me, the little machine really does the work." The modifications Reverend Herrmann made in the machine include a double edged blade which can be reversed when one edge becomes dull. He tells us that the cutter does all it was expected to do and even more. It takes good workmanship to turn out as nice a looking machine as this one, and so a $3.00 Workbench award and a Certificate of Merit go to Reverend Herrmann.**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# Editor's Workbench Chips

[*Continued from page 25*]

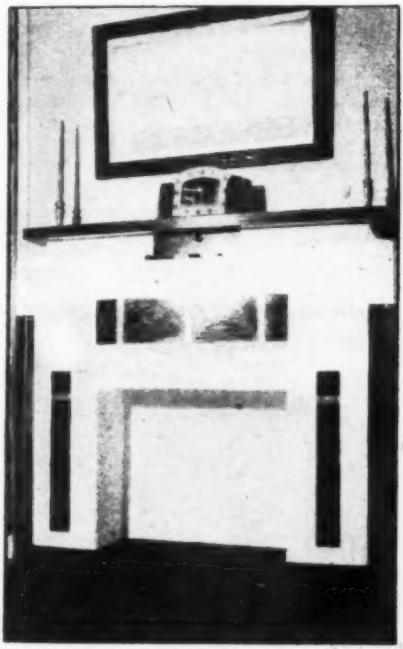
ments made by Frank L. Verwiebe of Eastern Illinois State Teachers College, Charleston, Ill.

His results controvert picture-supported claims made in Life magazine last fall that all "curves" are really straight and that the curves many persons protested having seen are merely optical illusions. They also contradict Life's assertion that if any curve occurs at all, it occurs in the first half of the pitch, the last half being perfectly straight. The measurements showed that most of the curving occurred during the last half, thus giving solid foundation for the "break" which so many fans insist they have seen.

The measurements were made in the same way that the path and the velocity of a bullet are determined. Four rectangular screens were set up between the pitcher and the home plate and one at the home plate. The five screens were crossed by vertical and horizontal threads, ac-

[*Continued on page 32*]

RADIO IN A FIREPLACE



Gerald Pamainville, of 485½ Gladstone Ave., Ottowa, Ont., Canada, built this ornamental fireplace to house his radio which had no cabinet. Aside from its decorative value, the artificial fireplace forms a novel radio cabinet. The controls of the set can be seen at the top of the unit. The speaker is in the top panel and does not show. Construction materials were chiefly ¼-inch plywood and plaster. The whole job cost $3.00, according to Mr. Pamainville. The $3.00 Workbench award that this picture brings the builder, will cover the cost. A Certificate of Merit also goes to Mr. Pamainville.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# Editor's Workbench Chips

[*Continued from page 31*]

curately spaced and aligned by a surveyor's transit. The position of the ball as it passed through each screen could be determined by the broken threads to within less than an inch.

One throw was intentionally straight, and the measurements showed that it really was straight. All pitches called as "curves" proved to be actually curved, the deviation from straight line travel varying from 2½ to 6½ inches as measured at the home plate. The outdrops deviated most, and are apparently the easiest curves to throw.

The speed of the ball was found to vary 90 to 130 feet per second, requiring from one-half to two-fifths of a second to travel the 50 feet from the pitcher to the batter's box. For a six-inch deviation, most of it occurring in the last fifth of a second, the ball must be traveling crosswise at two feet per second, which can easily give the batter the impression of a "break."

To cause a ball, launched horizontally at 130 feet per second, to rise, requires that it be given enough spin to lift itself 7½ inches, this being the distance it would fall during the flight by gravity.

---

"Prolon" has been suggested as a name for fibers spun from casein to differentiate them from other manufactured fibers.

---

Salting coal piles in winter keeps the coal from caking in troublesome lumps, Canadian railways find.

YUBA CITY SCOOTER

"MI is part of the heart of the smart mechanics in the good old U. S. A." says Calvin Wolfe, of Yuba City, California, in the postscript to his letter describing the scooter above. Calvin built the scooter, using a ¾ h.p. washing machine motor. He tells us that it can do 15 to 20 miles an hour, and that he has made a 458 mile trip on it at a cost of only 78 cents. The young lady in the smart riding habit is Calvin's sister, Opal. A $3.00 Workbench award and a Certificate of Merit go to Mr. Wolfe for this snapshot.

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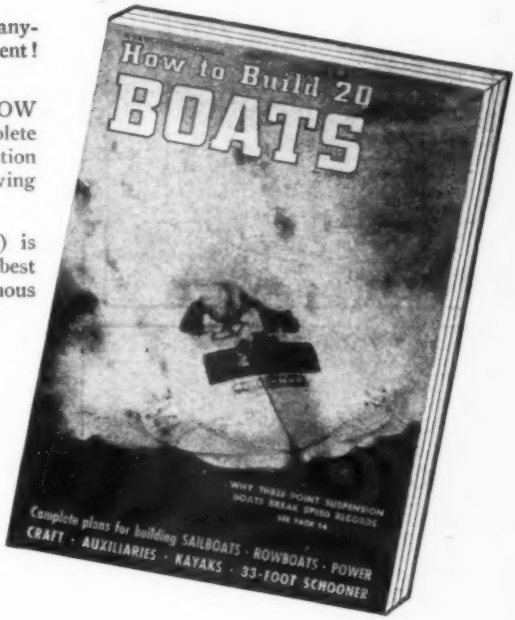
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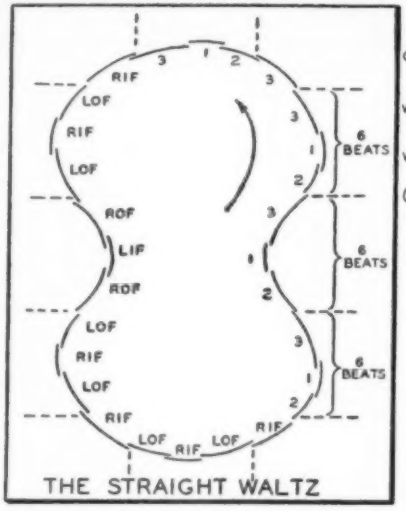
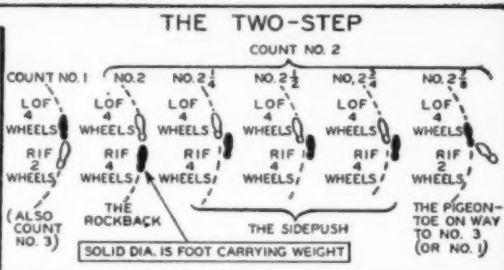
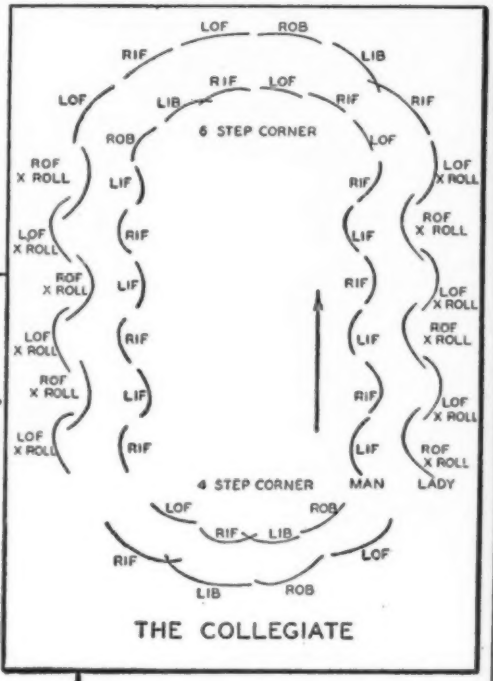
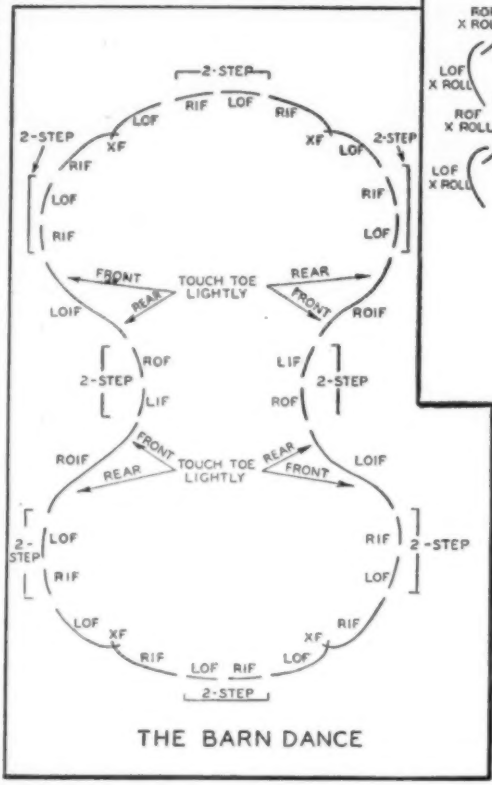
# Skating is More Fun if You Know Fancy Steps

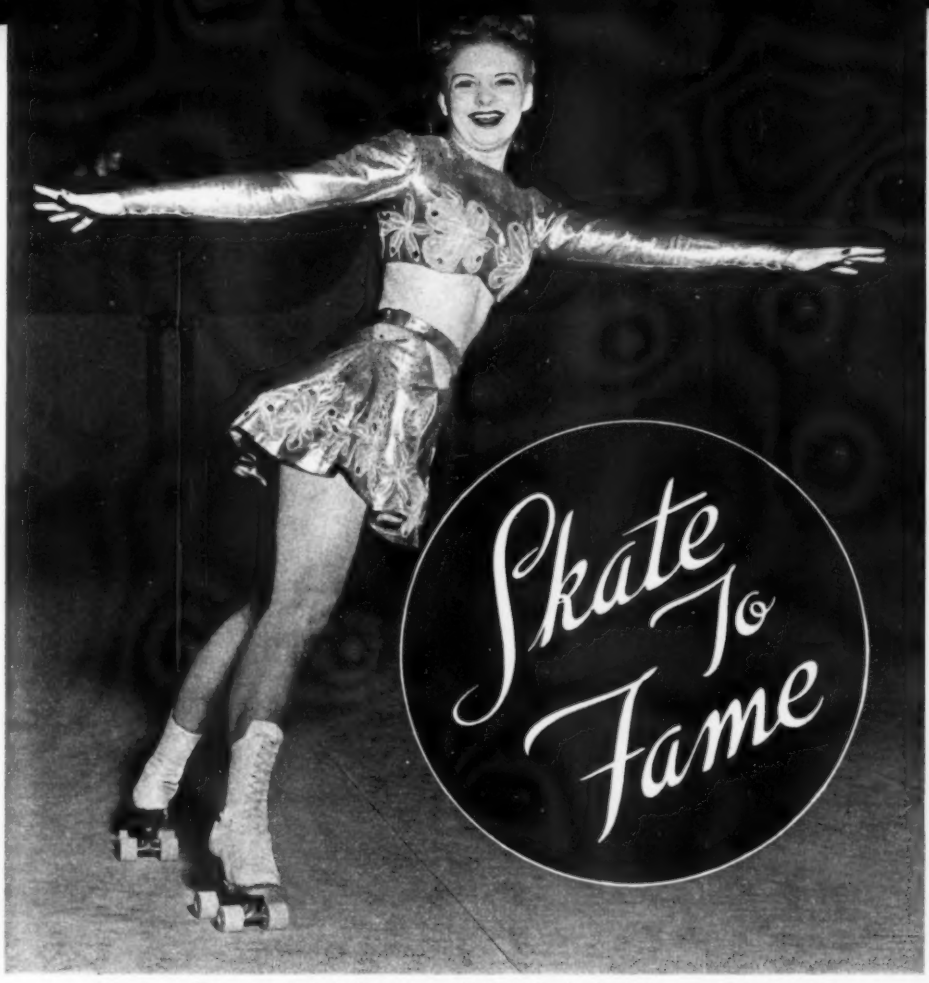



When you've acquired sufficient skill that you're gliding about the rink in long, rhythmic strokes, you'll want to progress to dancing on skates: complicated combinations of skating movements that are beautiful to see and exhilarating to perform. Three of the simplest, not requiring advanced skill, are diagrammed above. Directions are given in the article which begins on the opposite page. Such dances are of course for couples, sometimes trios, who can skate forward and backward, have mastered turns and spins, and in general have perfect control.




Recently an office-worker, Dolly Durkin is now the Sonja Henie of roller skates, an extravaganza star!

**Get onto roller skates and take a whirl into the newest national sport craze. You may become a Hollywood star!**

by Harold S. Kahm

SOFT lights flooded the big, glass-smooth floor. The sound of five hundred pairs of whirling, flashing roller skates mingled with the deep, rhythmic strains of a Viennese waltz as a girl and boy, newcomers to this palace of pleasure, stood hesitant at the entrance to the rink.

"Come on, don't be afraid!" said the young man, "you won't fall!"

"If you promise to hold me up—!" replied the lovely girl.

It was the first time Dolly Durkin, obscure secretary in a New York insurance office, had been on roller skates since she was a child.

Dolly's boy friend soon discovered he didn't have to help her. After a few minutes Dolly was swooping around the floor like a veteran. "Why, it was wonderful!" she exclaimed that evening on the way home, "I haven't had such fun in ages!"

From that time on Dolly Durkin, secretary, became one of America's millions of roller

skating fans, little suspecting the big surprise Fate held in store for her.

It came about quite simply. Dolly, through constant practice, became a better and better skater. It wasn't long before she could dance, do fancy figures, spins, a picture of fluid grace in her fluffy, white, brief skating costume. Other skaters stopped to watch her, amazed at her skill. One of them was a youngster by the name of Walter Hughes. Walter was good, too. He held the New York State Fair's skating title. "Say," he said to the flashing young star, "we ought to get together. You could go places."

Dolly Durkin did "go places." She became the National Figure and Dance Roller Champion. At 20, with Walter Hughes, her partner, she became a featured star of the "Skating Vanities of 1942," the nation's first mammoth roller skating show at Madison Square Garden. Dolly Durkin's secretary days were over!

*(Left)* "Don't be afraid, skating's simple!" A New York City school teacher learning how to skate well, the sport having been added to the Board of Education program. America today has 3,500 rinks joyously crowded like the one below and skating is now big business.

From the limelight of the Roller Vanities *above* came the four showgirls *below* to demonstrate skating's newly-practical aspect since war.

It has happened before, dozens of times; it will happen again, for roller skating is experiencing the biggest boom in its history, and the public is clamoring for new champions, new stars in every one of America's 3,500 roller skating rinks. Who will be the next one to be acclaimed? It may be you! For all it takes is a love of skating, plenty of practice, and a single spark of that magic stuff known as talent.

However, you don't have to aspire to stardom in order to have fun on roller skates. If you roller skated when you were a child it will all come back to you in ten minutes. You'll find it easier now, too, for roller skates have been greatly improved in recent years. But before we take up the art of skating for fun, let's examine the curious history of the roller skate:

In 1819 a Frenchman named Petitbleu thought he had hit upon the most sensational idea in history—little wheels to be fastened to each foot to double the normal speed of walking. These "foot wheels" would solve the

common man's transportation problem! Only the rich could afford horses and carriages. The trouble was that M. Petitbleu's "foot wheels" had no ball bearings, their three instead of four wheels made balancing difficult, and the wheels themselves were imperfectly made by hand. The few brave souls who dared the ridicule of their friends to try the new invention gave up after a few violent sit-downs, and the idea was considered killed for all time.

Actually Petitbleu was not the first roller skate inventor. Years before, a crude form of roller skates had been used for transportation in Australia and in Holland. Apparently they were better constructed than Petitbleu's. However, it wasn't until American inventive genius took a hand that roller skating made a real advance. In 1863 James L. Plimpton, a Boston inventor, brought about a revolution in roller skates. His improvement consisted in so gearing two pairs of wheels that they would "cramp" when the footplate was canted to either side, thus causing the skate to move on a curved line. Then later, another American by the name of L. J. Young put sheer magic into wheeled skates via ball bearings. After that the first world-wide roller-skating boom was on. Manufacturers were soon turning out two million pairs of skates a year, and rinks sprang up like mushrooms from Capetown to Seattle.

Tennis, football, and basketball games were played on roller skates—in fact, hockey was played on roller skates before ice skaters took it up. Roller derbies and marathons sprang into the limelight along with colorful revues, exhibitions of trick skating, and fantastic novelties such as roller-skating dogs, bears and chimpanzees. The gigantic roller skating fad of the Nineties was on in full blast!

Now, after a quiet interval that followed the World War I, roller skating is back again with the biggest boom in history. Daily, from Maine to Texas, half-a-million Americans of all ages put on their skates and whirl around the nation's thousands of rinks. Sailors are skating aboard battleships, soldiers are doing it in thirty U. S. Army camps, women shoppers are skating to market, athletes race in arenas, and glamorous young stars like Dolly Durkin and Walter Hughes are tasting the glories of the national spotlight.

Dancing on skates attracts couples and trios. Here are Henry Fonda, Ginger Rogers, and Alfred G. Vanderbilt on a Hollywood rink.

What's behind all this hullabaloo? It's very simple: roller skating is *fun!* That's why Americans are spending some $12,000,000 a year for new skates, $60,000,000 a year on admissions to rinks, and further millions on roller derbies, and other roller skating sports and shows. That's why Dolly Durkin is no longer punching a typewriter!

If you want to have your share of fun on roller skates—as well as a chance to become a star—experts suggest that you learn how to skate the right way. If you already know how to roller skate, but aren't doing too well, these same easy rules will benefit you:

1. A correct position of the body is necessary for proper balance; under no circumstances lean even slightly backwards. Always keep the body inclined forward, [*Continued on page* 148]

*These Boy Inventors Say You'll Soon*

# Light Your Home with PLASTICS

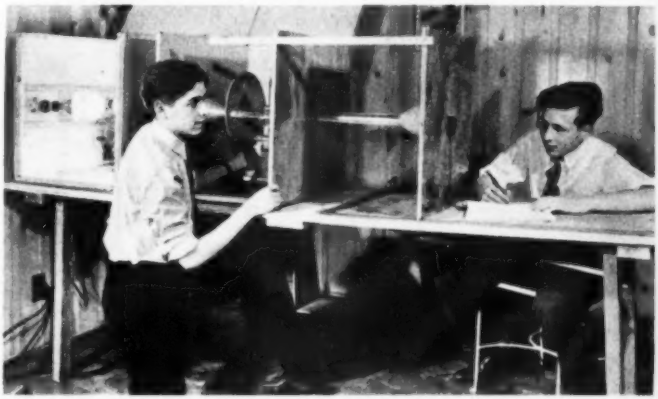
*Photos courtesy Westinghouse Research Laboratories*

THE home-workshop research of two high school boys in their mid-teens is promising one of the most practical and desirable developments which will literally make the post-war era a "world you never knew." For two years they have been experimenting on light-transmitting plastics—and now confidently foresee post-war homes illuminated by plastic bars carrying light to all rooms from one central source.

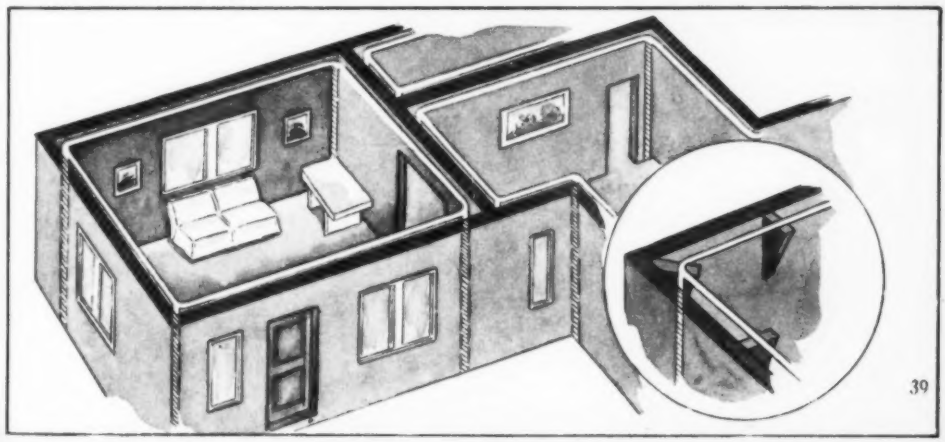
The young scientists are Irwin Arias, 15, and Edwin Silvers, 14, of Rockville Centre, Long Island, N. Y., who won the most recent Junior Science Congress award sponsored by the American Institute of the [*Continued on page* 166]

*Top:* Edwin Silvers, 14, and Irwin Arias, 15, demonstrate the bars of light-transmitting plastics by which they hope to illuminate houses.

*Left:* In their two years' research at home the young scientists rigged this device they call a "light transmission tester," to measure the light various plastics transmit.

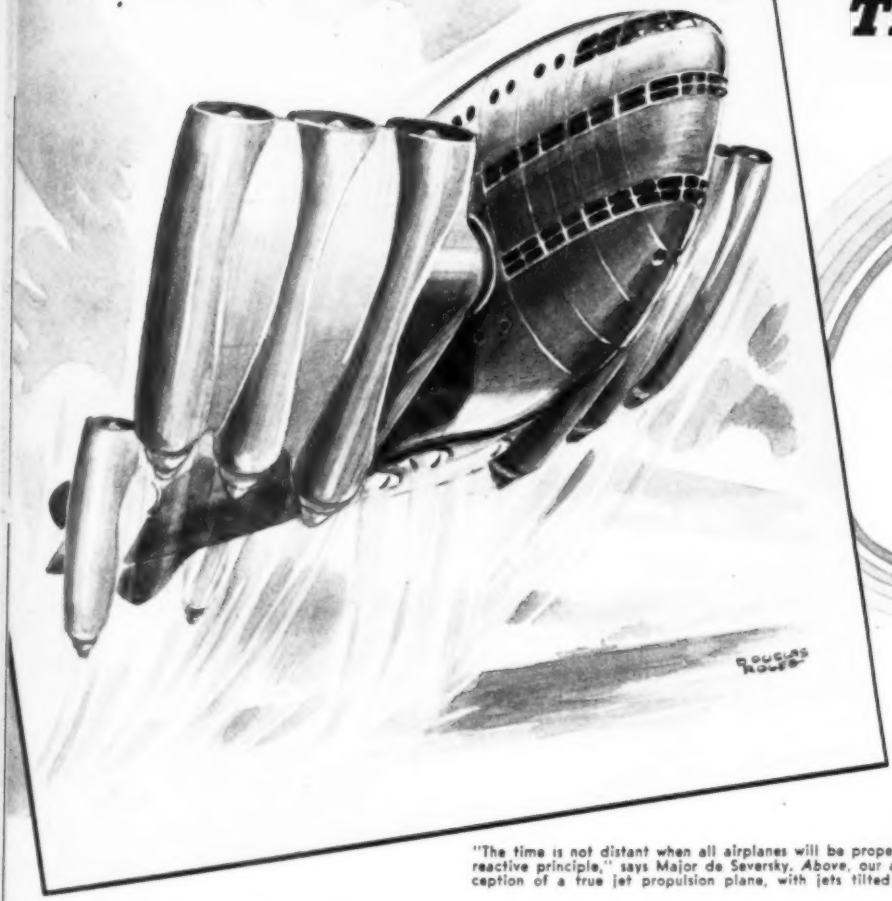


*Below:* Artist's interpretation of the "whiz kids' " scheme for lighting a house tubed with the new plastic they're seeking. Plastic hidden in the walls would transmit light from a central source (e.g., the cellar) to a section ringing each room just below the ceiling (see inset detail). This high-up plastic would glow with cold light. Refinements would obtain maximum beauty and utility from this basic idea of the boys.



# Major Alexander P.

# THE



"The time is not distant when all airplanes will be propelled on the reactive principle," says Major de Seversky. Above, our artist's conception of a true jet propulsion plane, with jets tilted for climb.

## A WORLD YOU NEVER KNEW!

That's what's coming as soon as the war is ended. It's going to be a world filled with scientific and mechanical wonders such as you have never dreamed of!

"Science in general makes more progress in a year of war than in a decade of peace," Major de Seversky says in his opening paragraph on the opposite page.

Major de Seversky is correct. For MECHANIX ILLUSTRATED, inspired by the major's statement, recently assigned one of America's foremost scientific writers, Donald G. Cooley, to make an exhaustive investigation of the marvels of progress being made during this war. What Mr. Cooley has discovered makes, we believe, the most amazing and thrilling series of stories we have ever read.

This series will cover the whole field of industry. It will start with an article in the October issue of MECHANIX ILLUSTRATED on "The Automobile of Tomorrow"—and we promise you that the real facts contained in this story will be more thrilling than any fiction you've ever read! Don't fail to buy October MECHANIX ILLUSTRATED for "The Automobile of Tomorrow."

# *de Seversky forecasts*
# AIRPLANE OF TOMORROW

AS A goad to action, the instinct of self-preservation is stronger than the lure of profit or any other human urge. That is why science in general makes more progress in a year of war than in a decade of peace. This is especially true of inventions and mechanical developments used as weapons or otherwise directly related to the war.

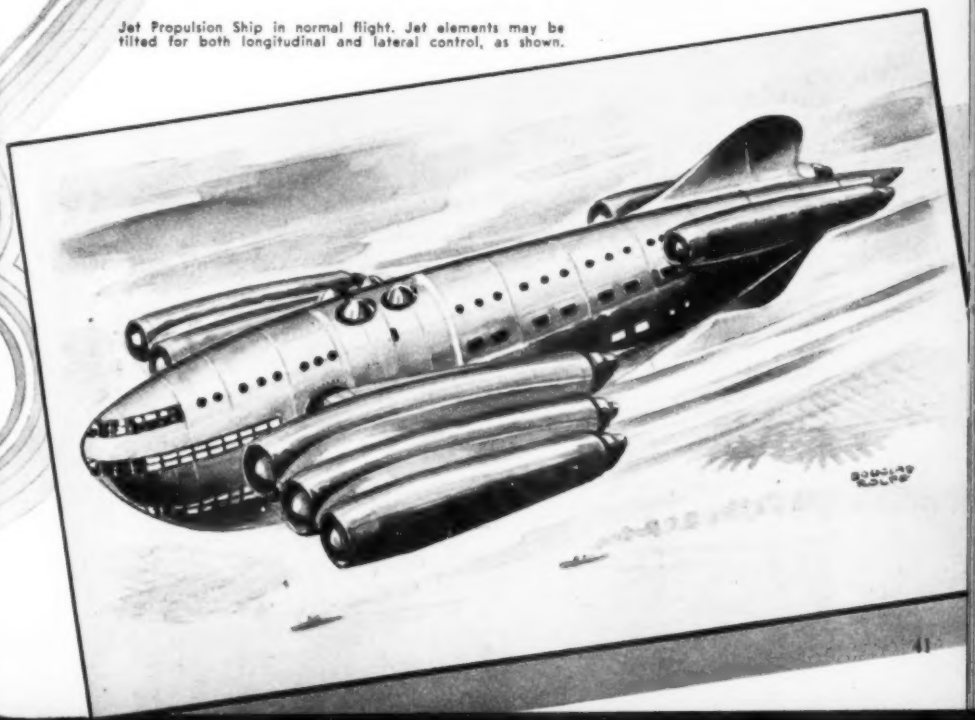
Certainly the airplane showed a technical advance in the four years of World War I which would have required perhaps a quarter of a century of peace-time puttering to accomplish. Before 1914 it was a primitive contraption which could not be rightly called a weapon at all, since it was practically unarmed. It was powered by an engine averaging not more than 100 horsepower and its useful load was negligible. By 1918, at the end of that war, the military plane had attained 150 miles per hour; it was powered with a single as well as multiple engines, each capable of 200 horsepower; it was well armed and could deliver explosive loads that could inflict real damage. Having entered the great conflict as a crude affair, it emerged as an efficient vehicle of transportation.

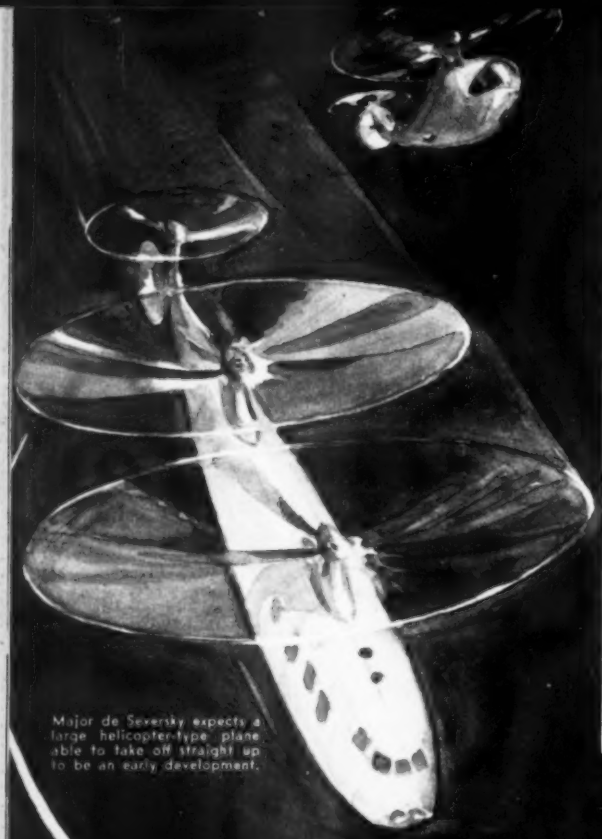
It is no less clear that World War II is providing a similar impetus to the unfoldment of the science of flight. Indeed, because we started at a point so far advanced, the actual perspectives of growth are immense enough to fire any healthy imagination. Even the directions of aeronautical progress already indicated by this war open up horizons that are all but limitless.

New principles of flight, new construction materials and fuels, increased efficiency of operation through improved precision of navigation instruments, have been indicated in the initial three years of World War II. Each of these things holds thrilling potentialities for the tranquil and civilized days to come after the horrors of war are ended.

Since Hitler plunged the world into the present tragedy, airplanes have raised their speed from 300 to about 450 miles per hour—an increase of 50 per cent. The advance has been even more impressive in the matter of size, range, and carrying capacity of aircraft. Progress has been especially marked in the

Jet Propulsion Ship in normal flight. Jet elements may be tilted for both longitudinal and lateral control, as shown.





Major de Seversky expects a large helicopter-type plane able to take off straight up to be an early development.

enhancement of military characteristics. In terms of armor, armament, weight of explosives that can be hurled at targets, the 1939 airplane seems outdated against 1942, and primitive against the models scheduled to come off the production lines in 1943 and after. The one certainty is that the tempo of further development will speed up with every passing month of this life-and-death struggle.

Before the war, only the airlines operated regularly in the face of adverse weather. While individual military pilots were taught to fly by instruments, military operations on a large scale were mostly confined to favorable weather conditions. Today military aviation virtually ignores the weather, far beyond our peace-time scheduled flights. In vital military operations, weather has ceased to be a consideration except when the target itself is wholly obscured by dense fog. This triumph

"Rocket devices will be built into fighter planes as an essential adjunct for flash performance . . . enabling the ship to spurt away from danger or to gain tactical superiority.

of science over nature has been accomplished by extraordinary improvements of precision instruments, de-icing equipment, and other essentials. What is more, for every advance already in use, a dozen greater ones are being perfected in the laboratory.

Radio and gyroscope have become mainstays of aviation. While a number of inventions in this field in relation to aircraft were made years ago, they lay dormant until wakened by the war. Take, for example, the radio locator. Back in 1928, under the auspices of the Guggenheim Aerial Research Fund, a radio altimeter was investigated. It operated on the basis of a radio wave. Released from a transmitter, the wave was reflected back to its source when it struck its object. Knowing the speed of the radio wave and the elapsed time, the altitude was thus obtained.

Though extensive experiments with this device were made under

Rocket bombs and radio gunsights on fighter planes will make them deadly
ENGINE EXHAUST JET NOZZLE
Land catapults, possibly equipped with rocket propulsion, will enable much more heavily loaded bombers to take off

A long line of de Seversky-designed P-35's in flight.

## ABOUT THE AUTHOR:

Major Alexander P. de Seversky is now acknowledged as the supreme prophet of Air Power. His book, "Victory Through Air Power," (Simon & Schuster, $2.50) is *must* reading for every American. Since its publication a few short months ago it has leaped to the top of best-seller lists and has been accepted as the "bible" of the strategy of military aviation, just as Admiral Mahan's writings were accepted as the handbook of Sea Power.

Major de Seversky fought with the Russian Air Force in World War I. He lost a leg, shot down 13 enemy planes and was decorated by the Czar. Coming to America without money or friends, his genius was soon recognized. He was commissioned by the U. S. Air Force, organized his own aircraft company, invented innumerable aviation improvements, including the first automatic bombsight, and established many aviation records. At left, he is seen shaking hands with President Roosevelt as he was awarded the Harmon Trophy for Aviation.

the able direction of Jimmy Doolittle, its practical use lagged until the war gave new impetus to the work. Today the radio locator, operating on approximately the same principle, bids fair to wipe out the difference between night and day fighting.

It can locate airplanes more than 100 miles away. The British often can tell when the enemy across the English Channel starts his engines, even before the planes take to the skies. The detector registers the time of take-off and follows the airplanes through the entire flight. The defending craft can locate the enemy plane in total darkness. As yet, the pilot must be able actually to see the target in order to fire. But it is only a question of a short time before firing will be done by radio direction, so that craft will engage in their duels under totally "blind" conditions. By the same type of instruments, airplanes will be enabled to bomb unseen targets and anti-aircraft defense will be able to fire

Drawn by the author, this is a design for a stratosphere fighter conceived by Major de Seversky. Note the four propellers.

at invisible attackers in fog, overcast or darkness.

Another phase of aeronautical progress worth careful watching is the use of rocket catapults to facilitate take-off of overloaded airplanes. The Germans apparently are applying this principle extensively. By catapulting planes and thus overcoming initial resistance, they add greatly to the useful load of any aircraft. The Russians are reported to have used the rocket principle to propel aerial torpedoes against armored forces on the ground. The most advanced embodiment of that principle was announced recently by the Italians; a "propellerless" airplane was flown over Rome, the report claimed, at a speed better than 250 m.p.h. (Editor's note: See MECHANIX ILLUSTRATED, May, 1942.)

Experimentally, of course, reactive propulsion of the rocket type has been investigated by all countries, including our own. The time is not distant, I believe, when all airplanes will be propelled on the reactive principle, and today's propellers will seem a relic of an early aeronautical age.

Now used principally for take-off, rocket devices are certain to be utilized soon in combat. They will be built into planes as an essential adjunct for "flash performance," as an additional thrust to provide momentary tactical superiority, enabling the plane to extricate itself from dangerous tactical positions or to press home its attack. Thus bombers, for instance, having delivered their blow, may "rocket" into the overcast or out of reach of pursuing fighters. Almost unlimited perspectives are also opened up by the emergence of practical rocket propulsion in the matter of amazing speeds at superaltitudes. [*Continued on page* 156]

## INVENTORS!

"The entire balance of fighting forces in this war may be upset at one blow by the emergence of one new invention," Major de Seversky says in the accompanying article.

Now, more than any other time in history, is the time for you to patent your ideas. Uncle Sam needs any ideas you may have to help win the war—and to assist in the making of a new world when peace comes. The distinguished members of the MECHANIX ILLUSTRATED Advisory Inventions Board, listed below, urge you to send in your ideas to Washington, at once, for the good of the nation. Major de Seversky's article may suggest ideas to you. The MI series, starting next month, "A World You Never Knew," should suggest many other inventions to you. Get busy, *immediately*!

**The MECHANIX ILLUSTRATED ADVISORY INVENTIONS BOARD**

**WILBUR SHAW**—Noted automotive engineer and inventor.
**CLYDE PANGBORN**—Aviation pioneer.
**DR. LOUIS D. CLEMENT**—Physicist, chemist and inventor.
**SIR HUBERT WILKINS**—Scientist and explorer.
**DR. JAMES L. CLARK**—Explorer and Ass't. Curator of American Museum of Natural History.
**LT. COMDR. BOB BARTLETT**—U. S. Navy.
**ROBERT COLES**—Noted astronomer and Ass't. Curator of the Hayden Planetarium.

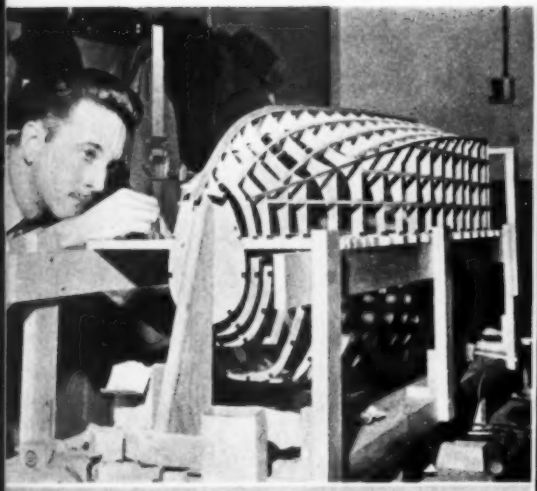
by Harold Kulick

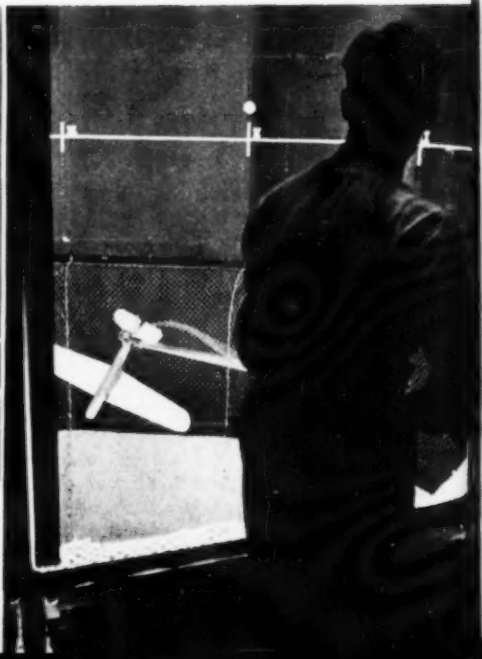
MODEL-builders like many of you readers of MECHANIX ILLUSTRATED are among the most important members of that big, vital group called "the men behind the men that man the planes" that are knocking the Nips and Nazis out of the sky.

For before those powerful, costly planes on which many lives depend are built, they must be tested exhaustively in miniature. And the government's found that the only persons who can build those test miniatures are the boy and men model-builders who have been turning out flying models and detailed shelf models for years. What was recreation and a part-time art to hundreds of modellers is now important but still pleasant labor on the federal pay-

Ready for wind tunnel takeoff. Peeking through windshield in floor behind the plane is remote control "pilot."

# THE WAR BRINGS *Jobs for Modellers*





*Above:* Checking hull and fuselage framing of flying boat model. Tolerance of .001 inch is usual on these models. *Right:* Model on pole held through spin chamber window by worker.

She's in a spin! And she'll keep spinning until observer brings her out by remote control. Then she'll glide into net. Note lights for movie camera.

roll. As our plane production soars, and as the progress of the war requires changes in designs and development of new aircraft, the demand for more modellers in this specialized, patriotic endeavor increases. Interested?

If so, you'll want to know details. Only a few can be given here. Pay is $1,260 a year with wide opportunity for advancement. Furthermore, manufacturers will need models of new planes for civilian use after the war so there won't be an end to the vocation when peace comes. Qualifications are within the reach of most good [*Continued on page* 151]

Light weight electric powered free-flight job. Worker adjusts controls.

# WAR in Paradise

Tahitian fishermen again rely on their seanit nets for food. *(Below):* With a hand-carved bowl, Vitua is off to make *poi*.

**South Sea Islanders are returning to the ways of their fathers as war ends trading.**

by Capt. Charles A. Borden

WAR has returned the simple, the primitive, the good things to Tahiti—brought peace and happiness to the Tahitians, really!

I have just returned from the South Seas and though on many islands once-lovely beaches are now strewn with barbed wire and hidden machine-gun nests, I found that the war, having isolated Tahiti, is fast returning the natives to the primitive life of a century ago.

Because it is of little importance commercially and because there are far better air and naval bases nearby, this loveliest of islands in the South Pacific is considered comparatively safe from war.

Far famed as the little Paris of the South Seas, Papeete, the port of Tahiti and capital of French Polynesia, has for long been the only town left in the Pacific where the major

War victims, empty copra cutters and trading schooners idle in lovely Papeete's harbor. *(Right):* The author at the *Wander Bird*'s wheel. *(Below):* Dependent on the sea, islanders keep fish traps always in repair.

commerce was carried on in sailing vessels. But today the silent waterfront is jammed with idle trading schooners and empty copra cutters, and the huge sheds are crammed with hundreds of tons of rotting copra. For although the 4,000 islanders in a plebiscite declared overwhelmingly for De Gaulle, for all practical purposes Tahiti is today an island without a country.

Long ago a notice on the Papeete postoffice bulletin board stated in French and Tahitian that the world was at war, that there would be no more ships to Tahiti to load copra, vanilla, or mother-of-pearl-shell, and to leave trade goods in return. After one hundred years of bully beef, tinned salmon, and trade calico the islanders became dimly aware that the white man's much-vaunted world had broken down and that they would have to return to the things they had before the white man came.

Today the whole island rings to the sounds of new earth being turned, of women's voices singing as they weave palm baskets and hats, of old men chanting and pulling on sennit fish nets.

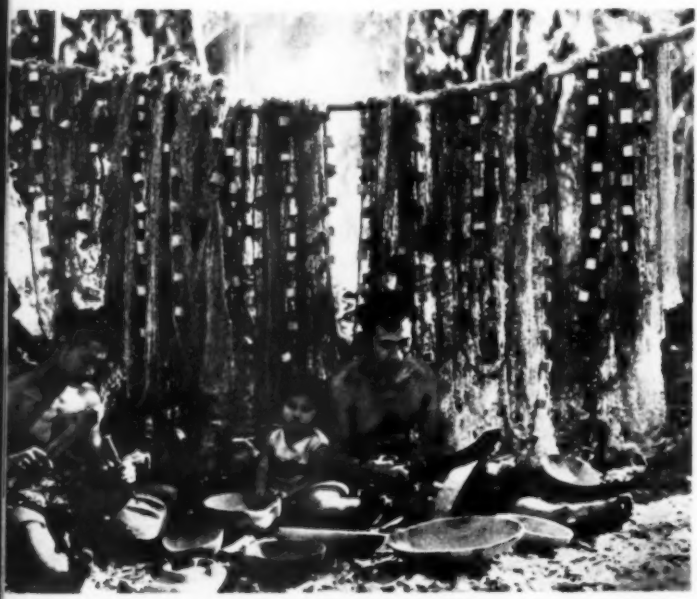
Sitting out on the verandah of old Tehapi's place, drinking cool orange beer and watching the restless coco-fronds reflected in the limpid waters of the blue lagoon, I found it almost impossible to believe that the same world could hold this tranquil happy island and the war-torn battlefronts of the civilized world.

In a valley near Piea I came upon a group of young girls humming nostalgic love songs

With war disrupting schedules of food supplies, natives pound arrow root for a forthcoming feast with renewed vigor.

as they crushed tiny white flowers into exotic *tiare* Tahiti perfume.

Spontaneous gaiety and laughter resound everywhere, for with an abundance of food, much of which is to be had for the mere taking, making a living is fun in Tahiti. It is rich in fruit and natural resources, chickens and pigs roam half-wild everywhere, and the sea and the lagoons are full of fish. In some lagoons the fish are so plentiful that children are able to catch them in their hands where the water is shallow. At night there are songs, laughter, and dancing. The young folk dance on the shores by moonlight and afterwards stroll off to make love on pandanus mats beneath the cocoanut palms. There are great-eyed, laughing brown babies everywhere. Almost before they can walk they are able to swim about the lagoons like little tadpoles.



Fishing over and nets hung to dry, Vita and Surai carve bowls.

With the aid of those who remembered the old ways it was easy for the islanders to return to a wholly self-sufficient way of life dependent solely on the sun, rain, soil, and the sea. Tehinatu knew how to weave baskets and hats. Turai makes sennit

nets and pearl-shell fish hooks, and old Airima has not forgotten how to make *tapa* cloth. To the sound of dull thuds I watched long wide strips of breadfruit bark being beaten with wooden mallets. Later the bark was flattened out and welded together until it was the thickness of cloth. Then it was placed in the bottom of a nearby stream, weighted down, and left for two days, then removed and left to dry in the sun.

Finally one day Vitua, a lovely slender young girl of seventeen with soft dark eyes, sparkling white teeth, and the most beautiful long silken black hair I have ever seen, called to me to go with her and watch while she designed the finished *tapa* with root dyes. The yellow sap of *mati* berries mixed and crushed with *tou* leaves formed a scarlet dye which she applied with a brush made of *hinano*. The *hinano* fruit are large and round, containing capsules looking something like barleycorn but tasting like cocoanut meat. When the juice is removed from the fruit its fine stringy fibres make excellent paint brushes.

Though they have accomplished great feats of navigation with crude instruments, Polynesians are ever interested in the white man's sea lore. *(Right)*: Teroni shoulders an old-type tool that's now being made again by his people.

It took half a day to design the finished cloth. When it was finally done Vitua brought it to me and, addressing me by my Tahitian name, said simply, "This *tapa* cloth is for you, Tehari. Take it with you across the waters and hang it in your *fare* (house) so that you will always remember your friends who love you here in Tahiti."

Long out of kerosene, Tahitians are rediscovering that homemade cocoanut lamps and candlenuts are adequate. The lamps consist merely of cocoanut shell cups containing cocoanut oil and a little sand to hold the wick. The wick is made from a piece of *tapa* twisted around a piece of cocoanut leaf rib and placed upright in the sand from the center of the cup. From candlenuts a simple form of candle is made that burns a low light. The candlenuts are gathered from the silvery-leafed candlenut trees which grow mostly on the cool mountain sides. The nuts are about the size of walnuts and are threaded on a rib of cocoanut leaf to form a taper that burns like a candle.

Without buckets, water is dipped up with cocoanut shells and carried in gourds or large wooden containers. Without boards and nails, houses are woven of cocoanut and pandanus leaves and bound together with cocoanut-fibre sennit.

Next to the cocoanut tree, the pandanus is the most valuable tree to islanders, furnishing them with wood and thatch for their

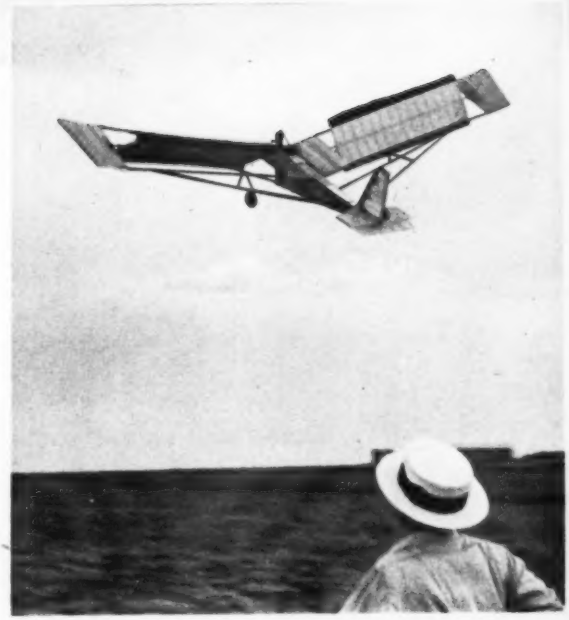
Tahitian *fei* gatherers (middle two are Free French lads) pause beside a mountain stream. *(Right):* Skipper of a now-idle copra boat, this young woman looks forward hopefully to the war's end.

dwellings. A pandanus house is far more durable and lasts much longer than one of cocoanut thatch. It also is woven into mats for their homes and used for clothing. The tender young tips from the tree trunk are baked and eaten. I found them quite tasty.

Next to pandanus in importance, perhaps, is the breadfruit tree. It bears three crops a year; the yellow fruit is round and often as large as a man's head. I prefer it baked like a potato; however, it can be cooked several different ways, all of them delicious. The sap of the tree is very adhesive and when fresh is used quite often for catching birds by placing some of it on a tree limb that is popular among birds. The tree fibre is excellent for use as pitch in caulking canoes and the durable red wood is much [*Continued on page* 151]

# RIDING ON ROTORS

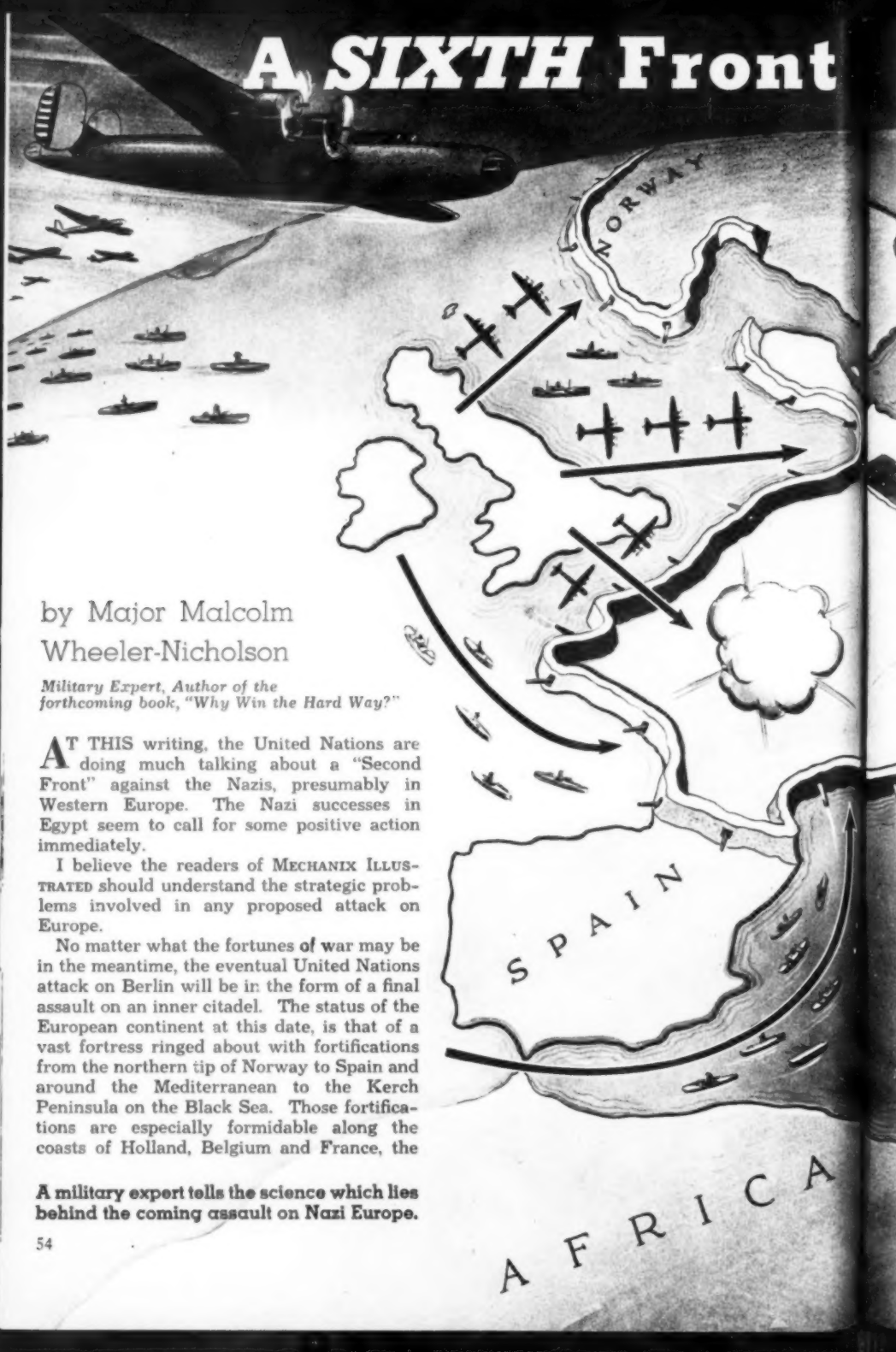
Artist's version of rotor-propeller, rotor-wing pursuit. Cannon would fire through hub of rotor-prop, as in conventional propellers. At right is a model rotor wing in operation.



TWO well known aerodynamic phenomena provide the basis for two recent aircraft developments that may have a pronounced influence on airplane design. One is a cylindrical-rotor-propeller invented by Ray Lavin Thompson, Hollywood engineer. The rotors are similar to those used on the Flettner rotor ship which gained fame some years ago. Their principle is simple enough: When a cylinder is revolved by power while a wind is blowing past it, the surface of the cylinder that is moving *with the wind* creates a lower pressure than the surface moving against the wind. The entire cylinder then tends to move toward the low pressure area.

[*Continued on page* 164]

# A *SIXTH* Front




by Major Malcolm Wheeler-Nicholson

*Military Expert, Author of the forthcoming book, "Why Win the Hard Way?"*

AT THIS writing, the United Nations are doing much talking about a "Second Front" against the Nazis, presumably in Western Europe. The Nazi successes in Egypt seem to call for some positive action immediately.

I believe the readers of MECHANIX ILLUSTRATED should understand the strategic problems involved in any proposed attack on Europe.

No matter what the fortunes of war may be in the meantime, the eventual United Nations attack on Berlin will be in the form of a final assault on an inner citadel. The status of the European continent at this date, is that of a vast fortress ringed about with fortifications from the northern tip of Norway to Spain and around the Mediterranean to the Kerch Peninsula on the Black Sea. Those fortifications are especially formidable along the coasts of Holland, Belgium and France, the

**A military expert tells the science which lies behind the coming assault on Nazi Europe.**

# Against The Nazis

*Mechanix Illustrated Drawing*
*By Reynold C. Anderson*

"All Europe is now, in effect, one great fort. It must be attacked with ancient siege tactics"—*the author.*

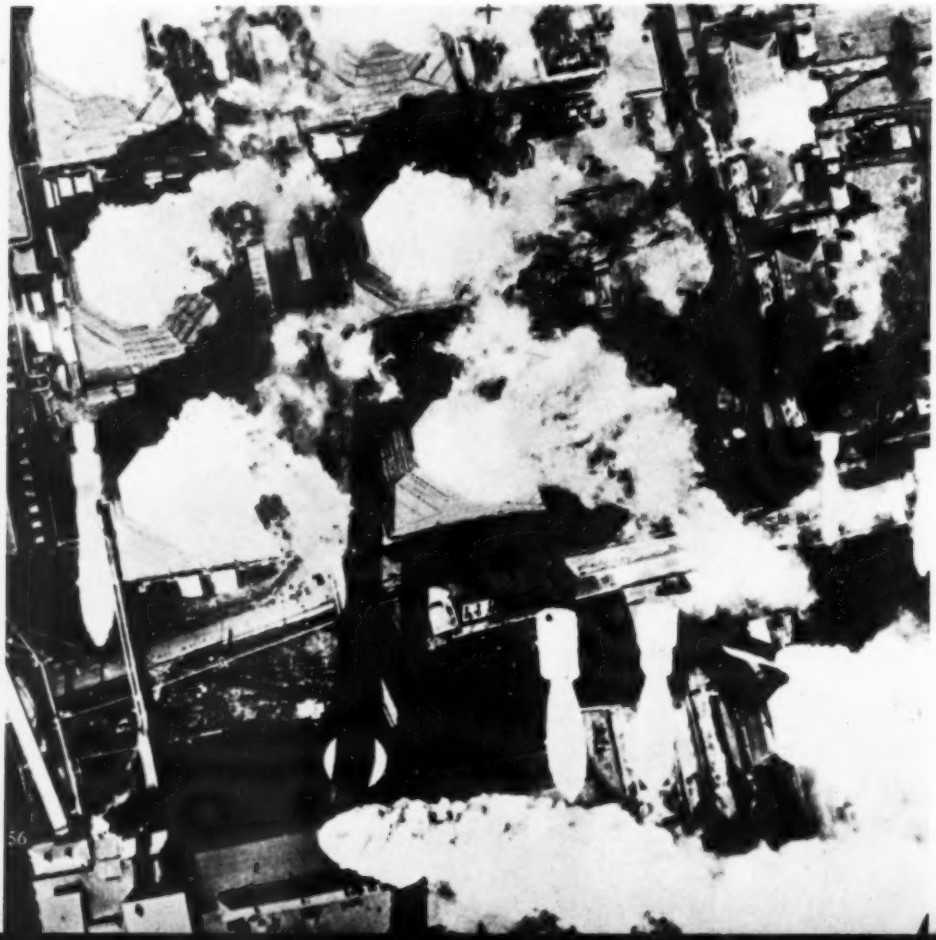
" 'Footwork,' in the form of many coastal raids, will force the enemy to dispersal." *Above*, a line of marine landing boats

logical and most easy route for an invasion springing from England.

These fortifications have been steadily strengthened, starting from the date of the armistice with defeated France. Hundreds of thousands of slave laborers under the skilled direction of German military engineers have shifted the guns of the French Maginot Line, the Czechoslovak Little Maginot Line and similar fortifications throughout Europe to these Axis defensive works against over-seas invasion.

With steel and concrete emplacements, concealed airplane hangars, thousands of heavy guns, machine guns and excellent intercommunication facilities, isolated frontal assault on these lines anywhere in Europe will be a costly undertaking faced with almost

"The bomber is the modern form of the ancient catapult." *Below*, white-painted bombs drop in the 1,000-bomber raid on Cologne.



And it's coming, Mr. Hitler! Just look at these American soldiers practicing a landing, in a Northern Ireland camp!

certain failure. In addition these lines of fortifications, on three sides, are situated behind great water ditches or moats, the moats of the North Sea, the English Channel, the Atlantic Ocean and the Mediterranean Tyrrhenian, Adriatic, Aegean and Black Seas. Naval and naval-convoyed attack against land-based fortifications have always been difficult, costly and seldom successful, even in the days when the maximum range of a coast artillery gun was 25 miles. With the range of coast defense increased from 25 miles to 500 miles or more by the simple expedient of carrying high explosives in airplanes, the attacker's task today would be practically suicidal. Without land bases for short range fighter planes to give him a protective umbrella against enemy aircraft, no military or naval commander in his senses would recommend such attack.

There are no bases along the three sides of the fortress, within short range fighterplane distance except the British Isles themselves and Malta. The greatest concentration of Axis air power is kept within striking distance of these two points to avert the possible use of these two bases. To top it all, the Axis possesses the advantage of interior lines, it can move its forces by the shortest lines to a threatened point. This actually means tripling the strength of its air and ground components. It can strike with the greatest concentration of force in practically any direction, against an attacker who is forced to move by the longest lines with the utmost dispersion.

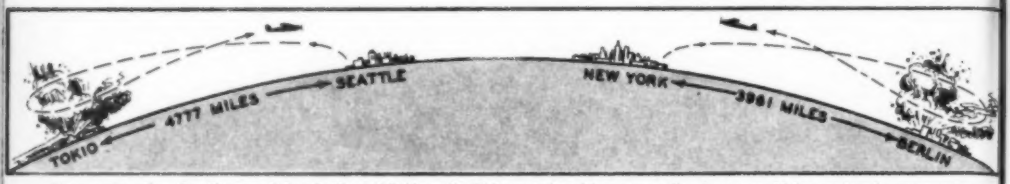
The task looks impossible. It is impossible looked at from the viewpoint of 1914-18, with its expeditionary force and "second front." A United Nations attack, in an effort to establish a "second front" in any one of several possible areas, such as Norway, France, Italy or the Balkans, would probably be welcomed by the Axis, for such attempt would be foredoomed. The Wehrmacht would simply dig in on the Russian front and concentrate the forces thus released against the foolhardy invader.

What, then, is the answer?

The answer is to cease looking at Europe as an aggregation of nations and national boundaries. The answer is to look at Europe as a great continental fortress, protected by great water moats on three sides and heavy land fortifications on the fourth or Russian side. [*Continued on page* 157]

# Beralite Will Bomb Berlin

**An amazing new alloy can now make our war planes lighter, stronger, and more powerful than ever before—**




The wonder alloy, Beralite, can bring Berlin and Tokio well within mass-bombing range. Our bases would be east and west coasts.

## An interview with E. Burke Wilford, President, Cooper-Wilford Beryllium, Ltd., by George Daniels

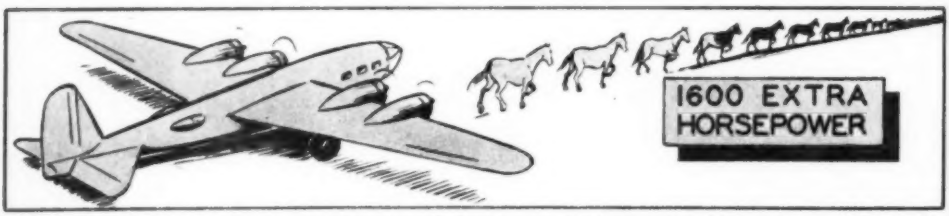
YES, Beralite can help bomb Berlin and Tokio, in force. Beralite is an alloy of the wonder metal for aircraft, beryllium, and aluminum: an alloy that was proclaimed an absolute impracticability by the top-ranking experts only nine months ago. Hugh S. Cooper and E. Burke Wilford, however, didn't think it was impossible, and for a very good reason. Cooper-Wilford Beryllium Ltd., of Philadelphia, was already experimentally producing it.

"The new alloy is lighter, stronger and harder than the conventional alloys of aluminum," Mr. Wilford told me, "and it has a greater fatigue strength and stiffness than duralumin." On the giant Douglas B-19, Beralite could save enough structural weight to enable the ship to carry an extra 9 tons of bombs. If the weight-saving were translated into a bigger fuel supply, it would give the ship a range of approximately 10,000 miles instead of the present 7,500.

But that's only a small part of the magic in Beralite. It can also increase the horsepower of an engine as much as 15%. On the B-19, that would amount to 1,600 more horsepower, or more than enough extra to fly an Airacobra or a P-40, or tow a tank-carrying glider. It could transform a 700 horsepower motor into an 800 horsepower motor, without changing a single dimension. And the motor would actually be 10% lighter than it was before the power was increased 15%. Keep in mind that this is not just an idea—this incredible alloy is in pilot production at this very moment.

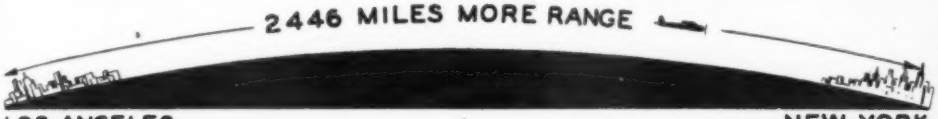
One of the reasons that an alloy of beryllium and aluminum seemed impossible to many metallurgists was the fact that the melting points of the two metals were more than 1,000 degrees apart (Be - 2345°; Al - 1260°). Most of the world will have to go on wondering how that problem was overcome. The secret will have to be kept at least until the war ends, for Beralite has given America an advantage our enemies would like to share.

When Burke Wilford tossed a little bar of Beralite into my hand, I asked him if he wasn't a little afraid that our unfriendly neighbors throughout the world might start turning the




Without changing a single engine dimension, ships like our B-19 can increase their horsepower by 1,600—and save weight doing it!

Weight saved by use of Beralite throughout construction of B-19, *above*, would enable it to carry extra 9 tons of bombs. Range increase would equal trip from New York to Los Angeles.

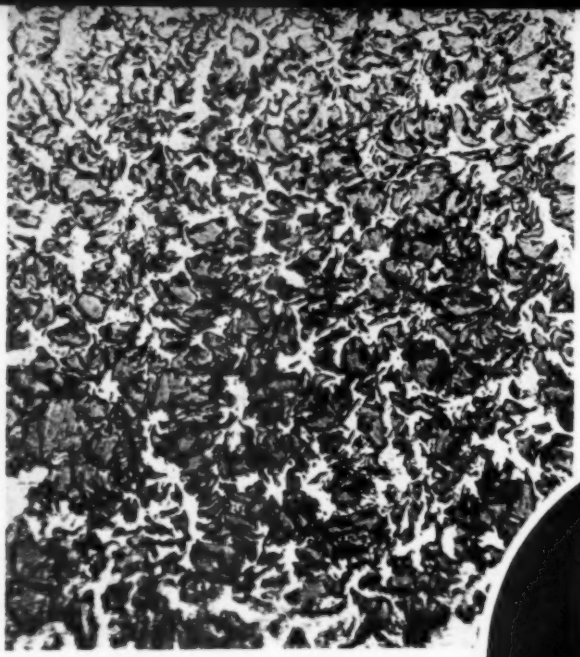



stuff out themselves. He smiled and told me that they'd been trying that for a long time and hadn't hit on the answer. It seems that they can see the value of beryllium as a partner for aluminum, but that's about as far as they get.

The Germans took 2,000 tons of beryllium ore out of South America in 1940—before the ore was made strategic by executive order in May of 1941. Apparently, like our own metallurgists, they have been successful in alloying beryllium with copper and other heavy metals to make many machine parts—such as springs and diaphragms that "never get tired." But Beralite is all ours at present.

It may seem a little odd that such a valuable element as beryllium went practically unnoticed for such a long time. It was first detected 144 years ago, by a Frenchman named Louis Nicolas Vauquelin. Louis was quite an investigator, having also been the first man to run across chromium. Now fate has apparently decreed that Hugh S. Cooper, who has brought Vauquelin's work to practical use, has given us a means of helping to win this war in the air.

The inability of science to produce beryllium in a satisfactorily pure form was one of the reasons for its century of insignificance. Even when comparatively pure beryllium was produced in small quantities, by Cooper, it was too expensive to be practical. Means were devised, in many instances, by which the metal could be alloyed with other metals, without ever really existing by itself. Compounds, such as beryllium oxide, are added to the other metal to achieve the remarkable results: but this is the first



time a real demand for elemental beryllium, in commercial quantities, has existed.

Now the obstacle of refining beryllium has been overcome. Mr. Cooper has succeeded in bringing the metal to a purity of 99.5%, which is commercial standard purity for other metals.

It's encouraging to know that there is plenty of this metal in the earth. In fact, the ground under our feet averages about 144,000 tons of beryllium per cubic mile. If it were all recovered from a single cubic mile.

*Above:* Beralite as it looks through microscope. White parts are aluminum, dark parts beryllium. In circle, Hugh S. Cooper, the man who gave America Beralite, the wonder alloy, to build America's super planes.

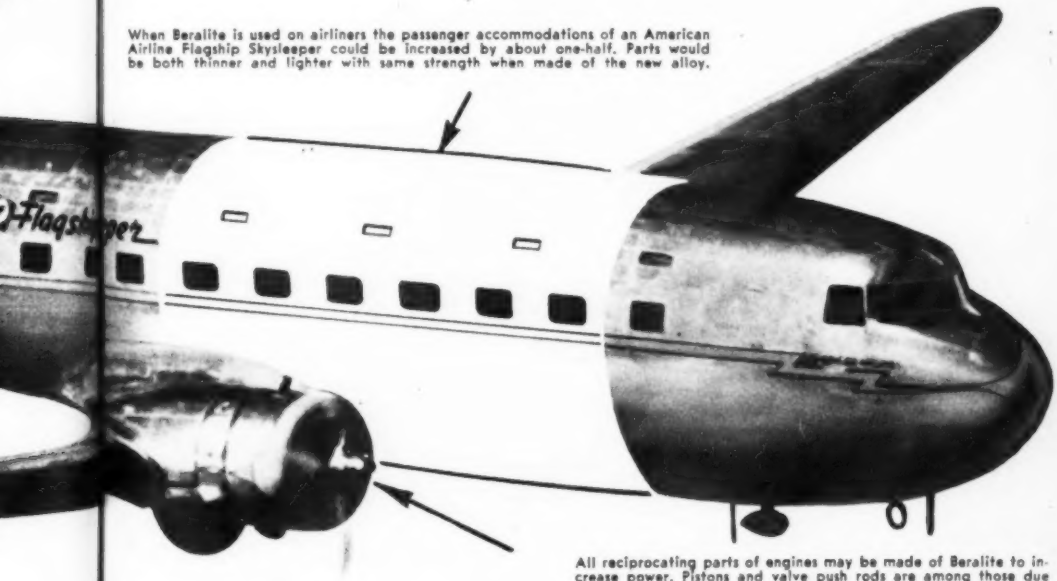
it would provide enough Beralite to build 2,000 bombers, each capable of carrying 27 tons of bombs.

It is easier to understand the tremendous weight-saving possibilities of Beralite when it is realized that each cubic foot of it is 25 pounds lighter than an equal amount of aluminum. That, however, is only half the story. Beralite is four times as stiff as aluminum. By putting two and two together, the designer quickly finds that he can not only make the same part lighter, merely by using the new alloy, but that he can also make it thinner without weakening it. As if all that wasn't enough, Beralite is also highly corrosion-resistant.

Used as a piston or cylinder-head material, it has a hot fatigue strength, at 600°F., nearly double that of the usually employed material. Incidentally, pistons are among the reciprocating parts in which the substitution of Beralite could bring power increases of from 10% to 20%, in addition to lightening the motor and adding to its life. Moreover, despite its hardness, it can be easily precision-machined. Mr. Wilford favors a conservative production program of development of the new alloy, and does not plan to apply it immediately to all parts of aircraft. He believes that it should [*Continued on page* 152]

Pouring a Beralite bar. At right is E. Burke Wilford watching the work.

When Beralite is used on airliners the passenger accommodations of an American Airline Flagship Skysleeper could be increased by about one-half. Parts would be both thinner and lighter with same strength when made of the new alloy.



All reciprocating parts of engines may be made of Beralite to increase power. Pistons and valve push rods are among those due for Beralite construction. More flying hours without wear would also result with Beralite parts. It is also corrosion resistant.

# BOMBER TEAM

BOMBARDIER: Second Lieut. Emanuel Snitkin, 23 years old, comes from Newark, N. J. In the bag he carries his precious bomb sight. He is boss as the plane makes a "bombing run."

GROUND CREW: They serve below and spend much time scanning the skies. Their job: Lightning repair work on ground.

PILOT First Lieut. Charles Gillis Esau, 25, of Burlington, Iowa. He is married, has one child. He is captain of the team. He is carrying his inflatable lifeboat and parachute pack.

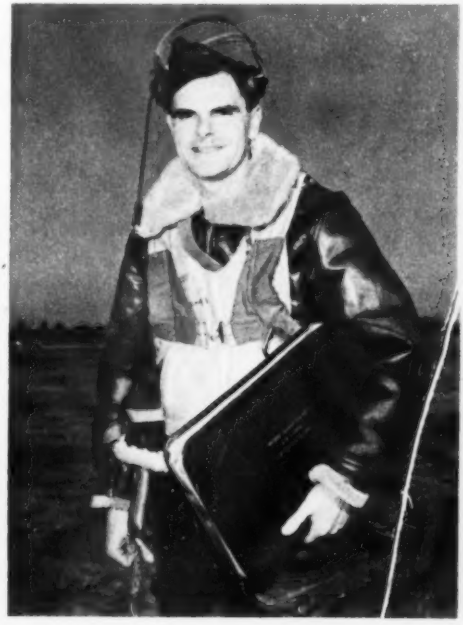
CO-PILOT: Second Lieut. Joseph Schilling, 24 years old, of Champaign, Ill. Married, he was called in July, 1941. He shares the "front office" work with the boss pilot, Lieut. Esau.

*Photos By Rudy Arnold*

IT TAKES team-work to fly a modern bomber. Thirteen men make up the team of an American B-25. Certain gentlemen in Tokyo and Berlin are beginning to realize that 13 is an unlucky number, too. Six of the bomber-team are fighters. Seven comprise the basic ground crew. On these two pages, MECHANIX ILLUSTRATED presents a typical B-25 combat team. Soon there will be thousands of teams like this one scouring the skies over the Axis territory.

GUNNER: Private (F.C.) Gregory Bournazor, 26, Ipswich, Mass. He packs the B-25's lead poisoning in the "greenhouse." Also, as engineer, he handles all mechanical work.

RADIOMAN: Sergeant Steve J. Chohach, 21, of Lewis Run, Pa. He is the link between plane and the home base and they call him "Ears." In combat, he doubles as air gunner.



NAVIGATOR: Aviation Cadet F. G. Sickinger, 24, of Columbus, Ohio. He carries navigation kit. The success of a bombing mission depends upon his ability to "get there."

American ingenuity keeps these recent class C regatta entries in trim with little more than wire and junk for repair material.

# BALING WIRE NAVY

by Bob Ruskauff

PROBABLY no American sport hit as strongly by shortages and priorities in war materials, has been continued this year with such unabated activity as speedboat racing.

"Baling wire outfits," equipped with props, gear boxes, and old spark plugs which their speed-mad owners had long since junked—only to resurrect—have been going into regattas, winning races, and, what is more, still setting occasional world records.

Seventy major 1942 regattas, only a few less than in normal years, are being conducted under sanction of the National Outboard Association and the American Power Boat Association over lakes, rivers, bays, and even ocean courses through America. This was according to the master calendar of scheduled regattas which got under way in April.

Kenneth Harmon, "baling wire artist" still amasses victories.

What is more, with exception of the largest and most powerful divisions, such as Sir Malcolm Campbell's *Bluebird* and Gar Wood, Sr's. *Miss Americas* of the unlimited class and the big Gold Cup racing jobs, every type and class of "marine dynamo" that has ever made speedboat history, is in active competition. This includes not only the inboard powered craft, which have a great deal of stock equipment and therefore a better chance to get the parts, but all of the outboard classes. It is here noteworthy that sale of all racing type outboard motors and parts ceased in April.

As far as concerns the matter of conducting regattas, military authorities have given the sport a clear green light, providing the activity in no manner impedes the war production program. With the curtailment and freezing of vital parts, this clearly couldn't happen. A miracle is that the motorboat boys are able to go ahead at all. But they are doing it!

The speedboat drivers have simply resorted to that "Yankee ingenuity" which has helped make us the most motor wise and speed-conscious nation in the world.

Inboard race pilots have "cut the grit" by numerous stratagems. They've measured pieces of cold-rolled steel, or the old drive shafts from model A or T Fords to supplant the prized pre-war shafts of stainless steel or Monel.

They are diving into the junk boxes, garage corners, and even resorting to dragging race

**America's speedboat racers show their Yankee resourcefulness by keeping their craft in Victory-trim with makeshift parts.**

When a racer hits a chop this can happen. To keep it in one piece with scrap materials requires a spark of true genius.

courses where a part was known to have been lost, to resurrect broken and once-discarded propellers. These are brazed up, refinished and sent back to the factory where they can be repitched to churn the race way once more. The welding torch has here become as essential as a right arm.

The "drink" has definitely ceased being repository for old spark plugs. These are nowadays carefully cleaned and stowed in cotton batting, against a likely need.

Brass castings being a thing of the past, drivers have discovered they can successfully duplicate the job by fabricating these highly essential parts with steel.

Not only in vital motor parts, but in the hulls, the magicians of marine speed have successfully resorted to substitutions. Boats are getting heavier since ordinary planking has taken the place of phenolic resin plywood, long-since frozen.

When it comes to racing the pernickety high-speed outboard motors—to which "a million things can happen and usually do"—the situation was pretty well explained by Bud Lundy of San Diego. This veteran of ten years in the outboard wars and 1941 holder of the one-mile C-class hydroplane competition world record, says:

"Standard repair equipment for every outboarder today is plenty of 'baling' (actually 20-gauge) wire; some eight penny nails and metal glue—plus one soldering iron which we take to the races and our welding torch, for home work-shop use. With this, we can just about repair anything that breaks."

As a manner of exemplifying his statement, Lundy recently won a Pacific Coast 25-mile marathon race in baling wire style. The pay-off lay in the fact that in warming up, the gas tank of Lundy's hydroplane had been knocked off and threads to the connecting pipe

Baling wire speedster Wally Francisco *(left)* made this barometer and humidity gauge from odds and ends and dime store parts.

stripped. It looked like a no-go deal. But, five minutes before the starting cannon, Lundy had made jury repairs. Tin foil out of a cigarette package provided thread surface on the pipe. The tank was tied on to the motor with one full roll of 20-gauge wire. This makeshift contraption somehow hung together for the full distance and Lundy breezed to victory in a rough-shod race.

The "quick repair and breathe a prayer system" has in fact developed drivers acclaimed by rival pilots for their ingenuity.

Outstanding is Kenny Harmon, a west coast pilot who holds the International 400-kilogram record at 77 miles per hour, with his powerful and rakish inboard displacement boat, *Zephyr*.

From stem to stern and including most of the motor parts, *Zephyr* is a homebuilt job. Time and again the craft has defeated costly, special-built creations that were wet-nursed to peak performance by the dollar method.

Yet the *Zephyr*, now four years active, has had five new home-built bottoms, after upsets and crack-ups. Practically the entire engine is of stock parts, rebuilt to make the most of allowed specifications. Harmon converted a stock manifold into a racing manifold; converted stock cast iron heads into high-altitude heads. He built up the *Zephyr's* special gear box, built and precisioned his own cam-shaft.

With his back yard genius, the inventive Harmon so often got into the hair of moneyed rivals who often followed him around the race course, that caustic comment always attended appearance of the "baling wire king" and his dynamite boat.

A year ago one rival got his perfect chance. *Zephyr* had upset on the course. The transom (stern) had been jerked clean from the boat and she sank. Next day, with the retrieved *Zephyr* on the ways, Harmon's rival passed by, pointed at the transom and sneered:

"If you'd bent the nails over that wouldn't have happened."

Harmon chuckles now:

"I did a slow burn then. But today, with brass and bronze screws completely unavailable and with nails even at premium, I guess that baby wishes he could eat those words."

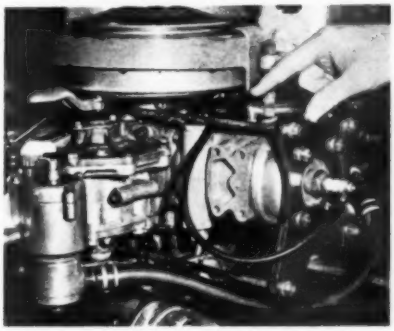
Lack of essential equipment has also been instrumental in bringing drivers to view more scientifically the factors which breed speed in using high-test fuel—but, particularly, with an eye for extending life of their motors.

For important help on these lines, they can

*Left:* They once threw old plugs away, now they reclaim them. Cylinder at right blew off when water got in. It can be brazed.

thank the experimental work with fuel mixtures conducted over a period of years by a former champion outboard pilot, Wallace Francisco of Los Angeles.

As an outgrowth of study on the humidity problem, Francisco recently perfected a device which he calls a "lubricated octanizer." By injecting lubrication to parts in the upper cylinder which had previously been unlubricated, the octanizer will add to the wearing life of any small, high-speed motor. The octanizer, in effect, will increase fuel octane rating and thereby add to horsepower while performing its extra - lubricating duty.



These steel braces bolted to cylinder heads prevent many a cylinder from blowing now they're scarce.

Francisco also devised a simple method for drivers to follow in proportioning fuel mixtures. This they can do at an instant's notice before the start of a race. Exhaustive tests at various race courses showed that atmospheric variation might be as much as 20° in a matter of moments. Hence, a driver with a perfect fuel mixture for the humidity at 10:30 o'clock might find his mixture too rich or too lean at 11:00 a. m.

Francisco accordingly developed (a) an "on the course" humidity and barometer gauge which could be made from two ordinary ten cent thermometers for a total cost of 29 cents and (b) a humidity reading chart by which a correct fuel mixture could be proportioned after a quick check with the barometer gauge.

The two devices have helped considerably to add life to the motor by lubricating and giving a balanced fuel diet to the vital "innards" of a motor. Important in the pattern of 1942 regattas is the fact that drivers in many American sectors are presenting their activity in a morale effort, aiding the wartime program. One western group of racing organizations, [*Continued on page* 175]

Here are some of 1,000 citizens of Tillamook, Ore., who organized a guerrilla band of civilians.

# How To Shoot GUERRILLA-STYLE

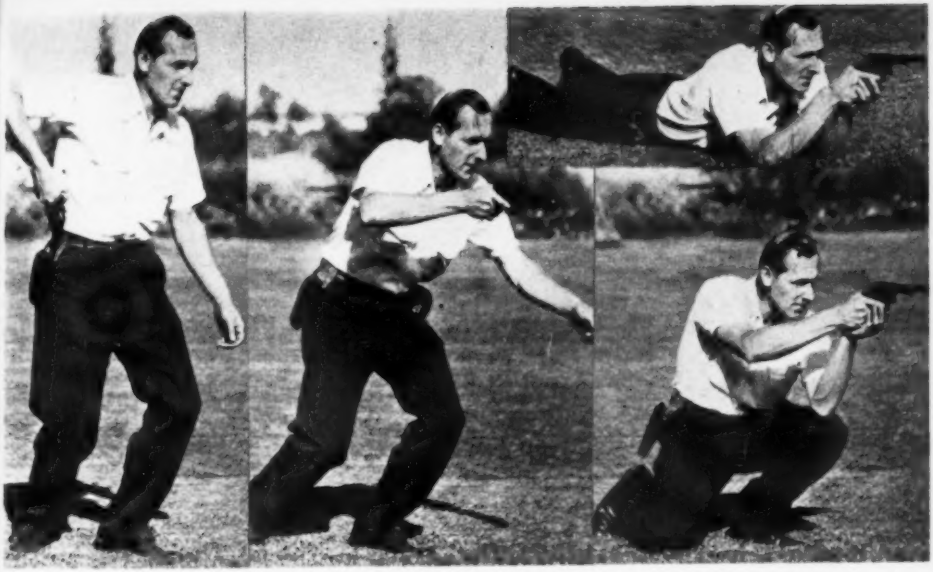
by Barry Storm

CIVILIAN guerrilla armies are being formed in thousands of American towns and cities today as the nation begins to realize that an invasion of this continent is far from impossible and may even be imminent.

Guerrilla fighters in Russia, China and Yugoslavia have been of invaluable aid to their regular armies; indeed it has been said that Japan would have overrun China and Germany would have smashed Russia long ago had it not been for the back-of-the-lines resistance put up by native guerrillas.

How do you become a guerrilla? What must a guerrilla know about combat shooting?

This is a new kind of war with man's mechanical mastery of the air bringing ability to strike far ahead of armies, bringing ability to the enemy to strike at the lifeblood of our armies—US! Paratroopers, saboteurs, secret agents, enemy sympathizers may strike a telling blow anytime unless we are as alert as were the minute men of '75. Indeed, we must be doubly prepared because comparative odds are far greater; a paratrooper's tommygun can spew out 300 bullets a minute, the saboteur's grenade can blast a house apart. There is only one answer: shoot first, shoot fast, shoot to kill. No citizenry in the world is better armed than the American. For generations we have been conquering frontiers, indulging in hunting and target shooting as pastimes. And millions of American homes contain fine shotguns, precision rifles, accurate pistols. These are our guns for defense. Let us consider how we may use them.



Author Barry Storm demonstrates two quickly-assumed positions for combat shooting with pistol in photographs above.

## TWO-HAND GUNS

Rifles and shotguns, generally speaking, are handled much alike in fast snapshooting, involving such similar component actions as stance, sighting, and trigger squeeze. And while it would be presuming to tell a hunter who yearly gets his bag of ducks on the wing or deer on the jump how to handle his favorite weapon, a few pointers in adapting his shooting methods to combat use are necessary.

Combat shooting of any kind is built around

Sportsmen Guerrilla Army Urged To Aid U.S. Defense
Home Guard Plan Studied
Rifle And Shotgun Owners Suggested For Emergency Force

The author demonstrates two unorthodox positions easily managed for effective combat shooting.

*Above*, the author demonstrates standard snap-shooting positions adapted to combat use by guerrillas. In shooting from the hip, pivot from waist to follow a moving target. A white rag tied on barrel makes night shooting possible. *Below*, two-hand pistol grip.

three essentials, namely: (1) delivering the first shot accurately, (2) making yourself as small a target as possible in case the fire is returned, and, (3) delivery of a superior fire - power. Since we could hardly compete on equal terms with a trained soldier in the latter respect, ability to defend ourselves will depend entirely upon the first two points. With two-hand guns such as the hunting and target arms which most of us possess, we need only add to our repertoire a few simple maneuvers in order to achieve the first two essentials, with a small amount of practice being sufficient to add facility under the stress of excitement.

Of the two long arms, the prosaic shotgun is the most deadly combat weapon within the limits of its range. It is the more deadly because of the speed with which it may be used accurately by even an inexperienced person, practically anyone being able to hit with it due to its large shot pattern. In fact police have their riot guns and soldiers their trench guns to take advantage of just this feature. And usual snapshooting stances are shown in the accompanying illustrations.

However, method of use which best combines the greatest speed in delivering a shot with accuracy sufficient for combat use will depend entirely upon the range of the target. Where the target is within twenty yards or so, and probably moving rapidly in an

Russian peasants turned guerrillas, above, are credited with much of the Russian success in stopping first Nazi drive.

effort to take cover, the hip shooting stance shown will with a little practice give sufficient accuracy. In addition it has the advantage that a moving target may be followed with the aim by merely swinging the body around to either side as necessary, using the waist as a pivot. The same maneuver may be performed with the sighting stance illustrated though not with the same facility.

Both of these stances are familiar to all of us who have hunted or used the target range and while neither is exactly orthodox in point of shooting form, both are entirely natural. Naturalness contributes much to speed. And practice will bring facility. Enough practice should be indulged in to make all maneuvers second nature, to pick up the knack of shifting instantly from one to the other.

Of course rifles require a more careful, more exact handling than shotguns. But a fair hunting shot will be agreeably surprised at the ease with which he can punch a man-sized target full of holes if he will only expend a box or two of cartridges in practice, and give some thoughtful attention to the job. And certainly we owe the possibility of instant isolated or "spot" defense that much trouble.

The kneeling and prone positions illustrated with the rifle serve very well the purpose of shrinking oneself as a possible target. In addition they offer adequate support for more accurate longer range shooting and enable one to shoot reasonably well if tired or winded. Either can be assumed instantly after the knack is caught.

## ONE-HAND GUNS

The revolver and pistol, unlike the longer arms, require considerable practice by the novice for even mediocre results. But most of this practice can be executed without firing a shot, resulting in astonishing speed and accuracy sufficient for combat purposes. Accuracy of course will nowhere nearly approach target shooting standards, nor is it meant to.

The most important feature of handguns is that their comparative convenience makes it possible for even mediocre shooters to get off the first shot *first*. This ability is as dependent on drawing [*Continued on page* 170]

# Mess Call

by Grace Kirkpatrick

"I WANT you to bake twelve thousand pounds of bread today."

"Yes, madam."

"And be sure you don't turn on any lights while you are mixing the dough—oh, yes, we've put the ovens in the bottom of a gully over the hill—it'll be muddy there—but then—"

"In a gully! Yes, madam. But may I ask how I will get the bread up the hill when it is baked?"

"We'll send you a cart drawn by water buffalo—you can haul it out."

"Yes, madam."

An absurd and ridiculous conversation, you say.

If it were between mistress and cook, yes—but it describes the task which, while supplies and resistance held out on Bataan, the men who baked the bread for the heroic forces of General MacArthur accomplished.

The newspaper correspondent who reported the incident is said to have stumbled on the army bakery by accident. He found the well-hidden ovens in the bottom of a gully that was cluttered with trees and brush. Stretched out over a half mile, the ovens were being stoked with hard wood to eliminate telltale smoke. Shields over them shut off the glow of the fires. Under these difficult

The spud no longer is a nightmare for the Army K. P. Now a piece of machinery *(left)* does the peeling, automatically.

"SOUPY, soupy, soupy, without any beans" is what mess call used to be. But in the new army, the men run for it *(above)*.

**Don't worry about that man in the Army—they're taking care of his tummy in swell shape. And here's how:**

Huge steam vats such as those above are used to turn out the vast quantities of food that hungry soldiers call for.

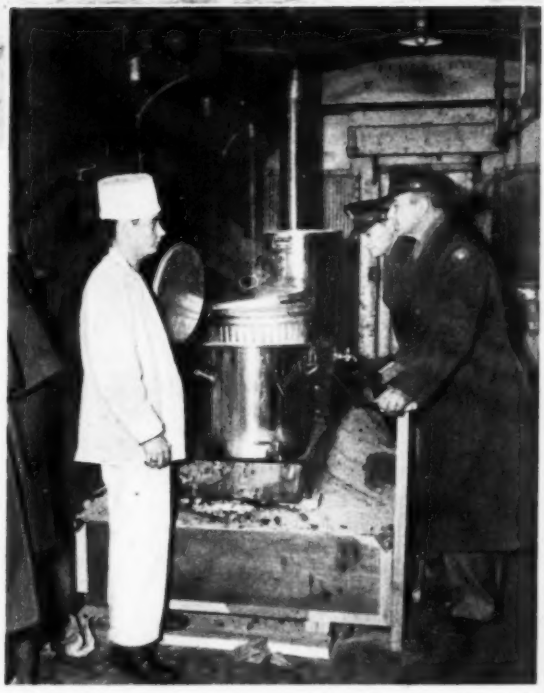
conditions, the soldiers turned out twelve thousand pounds of bread a day and loaded them on wagons pulled out of the deep gully by water buffalo, for delivery to the beseiged troops.

You have to be pretty good to manage a cooking job like that—and the "Army Cook" is good; moreover, is now being streamlined.

Not that anyone suggests that there could have been improvement in the brand of men on Bataan peninsula—but the men who baked and cooked there were "officers and members of the quartermaster's corps,"—while the "Army Cook" dates back to 1878 and continuous service since that time.

Don't start to figure his age, for the Army

Even in the Arctic the Army gets hot meals, from traveling field kitchens such as the one at right.



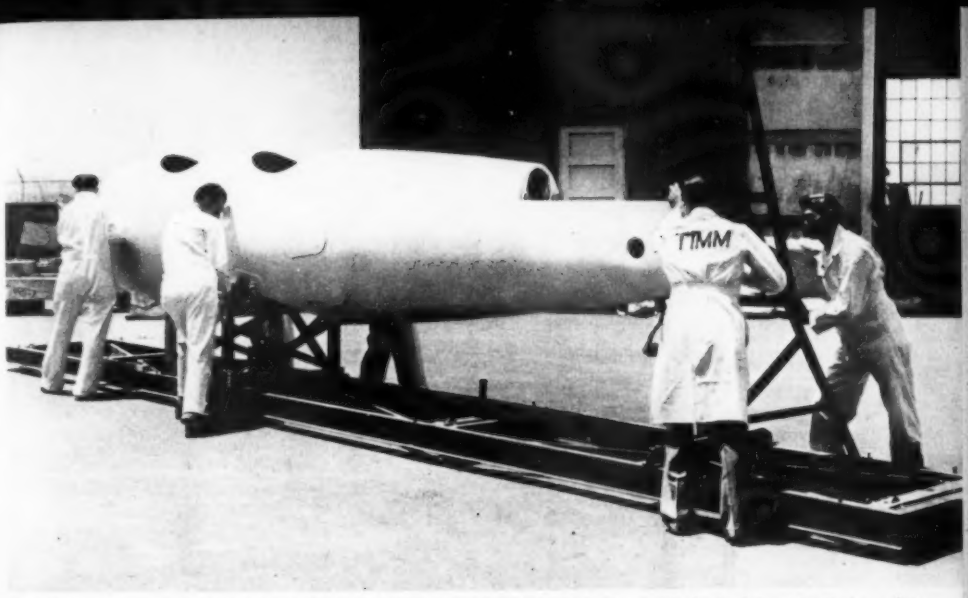
A soldier gets hot food until he out-fights his supply lines. Then he must use emergency field rations, shown above *left*.

Cook is not a person, but a book. It is the most read book in the service. The mess sergeant cherishes it the way a housewife loves the "receipt" book inherited from her grandmother.

The Army Cook is an inheritance also. Back in December, 1877, Army Order No. 177, Headquarters of the Army, Adjutant General's Office, recognized that there was need for a cooking guide and stated that a board should be appointed to prepare such a manual.

In June, 1878, the Commissary General reported the board had completed its experiments and was printing the book which would be distributed when complete.

But the army had some pretty good thoughts on cooking [*Continued on page* 176]




Fresh from the oven, the plastic plane's fuselage, sleekly streamlined and absolutely smooth, is wheeled out for final assembly.

# Recipe For A Baked Plane

A baker's and flyer's joy, the finished plane is 24½' long. Wing span is 36'.

**Soak a plywood fuselage and other parts with phenol resin, put in oven and bake—out pops a fine plane! Here are full details.**

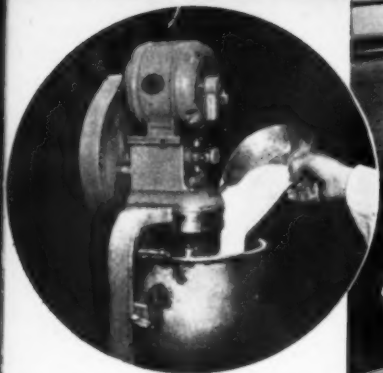
*Patty-cake, patty-cake, baker's man*
*Bake a cake as fast as you can!*

THE old nursery-days rhyme has a new version nowadays. A substitute word goes into the second line so that it reads

*Bake a PLANE as fast as you can!*

in testimony of the great demand for the Timm Aeromold trainer plane for U. S. Navy and Civil Pilot Training use. The craft is literally a baker's product! The plywood fuselage, impregnated with phenolic resin and only a rough approximation of what a plane's body should be, is rolled into a huge oven with its other parts, submitted to controlled humidity heat—and comes out smooth and fine as the best bakery cake!

A whole lot tougher, though! Exhaustive tests by the Army and Navy air corps proved the strength of this plastic-bonded plywood in what is truly the plastic plane about the



*Above:* An ordinary mixing machine combines three primary ingredients—one a powder, the others liquids—into a resin that much resembles bakelite.

*Above:* Three layers of thin spruce plywood the length of the fuselage form a rough beginning structure. *Left:* A pressure sprayer then soaks it with the phenolic resin. Next: moulding.

future of which there has been so much speculation. As a result, Timm's Aeromold process is now looked on as of great importance to the aircraft industry as a whole. Following the government tests, the company found it necessary to organize a special division to specialize in making plastic-bonded plywood sub-assemblies for metal combat ships and advanced trainers. That's in addition to the Timm trainer, the plastic plane itself, which is now being welcomed not only for its own excellences as a ship but because the new method of its manufacture takes fewer scarce metals and other materials, and shows possibilities of its being more rapidly expanded than usual methods.

*Left:* By pressure the structures are moulded into fuselage halves.

*Right:* The moulded fuselage half-skin is slipped into place simply. Rapid-setting resin secures joints.

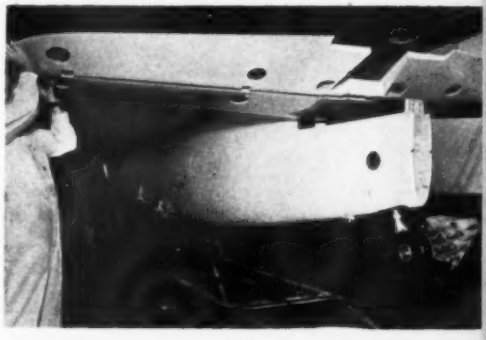
*Above:* Ready for the ready oven, one complete airplane's parts are wheeled in for baking by controlled humidity heat. *Below:* Afterwards the tail and wing are lifted on and fastened.

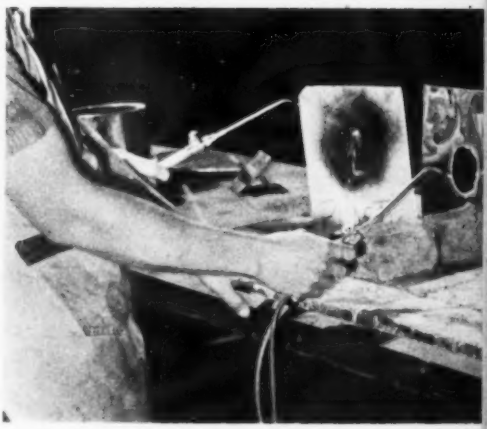
That may be a factor of growing importance if the time comes when plastic planes are deemed worthy of service beyond training.

What's the recipe for these flying products of an oven?

First, three layers of spruce plywood, each but one-twenty-fourth of an inch thick, are laid over the formers and bulkheads of the fuselage-to-be. These are so applied that the center layer is cross-grained to the two inside layers, and all extend the full length of the fuselage. They are held in place by strips of masking tape.

After the plywood veneer has been thus formed, phenolic resin is pressure-sprayed on the surface so that [*Continued on page* 174]





Dural failed tests the plastic easily passed: *Above:* dural burns through, plastic just chars; *left,* a dropped metal ball that deeply dented dural, bounds from unaffected plastic.

# You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. A pantograph is a collapsible current-collecting apparatus used on top of some electric trains.
   True ☑ False ☐

2. An ornithopter is a type of aircraft carrying its propellers at the rear instead of at the nose.
   True ☑ False ☐

3. A template is a large jewel-studded plate on which ancient Egyptians made offerings of fruit in their temples.
   True ☐ False ☐

4. Hysteresis is not a mental condition in which the victim gives way to tears.
   True ☐ False ☑

5. Calipash and calipee are the names of the only two kinds of gourds from which meerschaum pipes are made.
   True ☐ False ☐

6. Horoscopes are instruments used by submarine crews in aiming torpedoes at surface vessels while the submarine remains submerged.
   True ☐ False ☐

7. Port wine gets its name from the fact that it was originally stowed on the port side of the vessels in which it was shipped, the starboard being occupied by the crew.
   True ☐ False ☐

8. A physician's prescription is necessary in order to buy galoshes in Norway.
   True ☐ False ☐

9. Distilled musk, used in perfumes, can be obtained from the musk glands of muskrats.
   True ☐ False ☑

10. Ants and termites are not the same; ants being the one important natural enemy of termites.
    True ☐ False ☐

11. "Snake eyes" do not all have round pupils, as copperheads and some rattlesnakes have vertical eye pupils.
    True ☐ False ☐

12. Although tuna fish are among our best known food fish, their spawning grounds have never been discovered.
    True ☐ False ☐

13. A single Holstein-Friesian cow has produced almost 21 tons of milk in a single year.
    True ☐ False ☐

14. English aircraft now owe some of their strength to kitchen scraps, as all the glue now used in them comes from bones saved in British kitchens.
    True ☐ False ☐

15. Tung oil, widely used in paint, is obtained from the soft-shelled tung, a type of African lizard.
    True ☐ False ☐

16. Although there are many uses to which they might be put, scales have never been produced that are accurate within 40 billionths of a pound.
    True ☐ False ☐

17. Deadwood is the decayed planking that must be removed monthly from the hulls of all wooden ships.
    True ☐ False ☐

18. The largest birds that ever existed were the now extinct elephant birds of Madagascar, which were sometimes eleven feet in height.
    True ☐ False ☐

19. In all modern automobile and aircraft engines both the crankshaft and the camshaft turn at the same number of revolutions per minute.
    True ☐ False ☐

20. A Pitot-static tube is a type of radio tube used in frequency modulation sets to eliminate static.
    True ☐ False ☐

21. There is only one true species of raccoon.
    True ☐ False ☐

22. The pistons of all internal combustion engines revolve in the cylinders at from 850 to 2200 r. p. m.
    True ☐ False ☐

23. No animal in North or South America can harm an armadillo when the latter carries out its protective measure of rolling up into an armored ball.
    True ☐ False ☐

24. It is possible for the air moving over the upper surface of an airplane wing to travel faster than the air moving past the lower surface.
    True ☐ False ☐

25. Although seemingly playful, porpoises are among the most vicious man-eaters in the sea.
    True ☐ False ☐

### WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 161

# NEWS OF SCIENCE AND MECHANICS

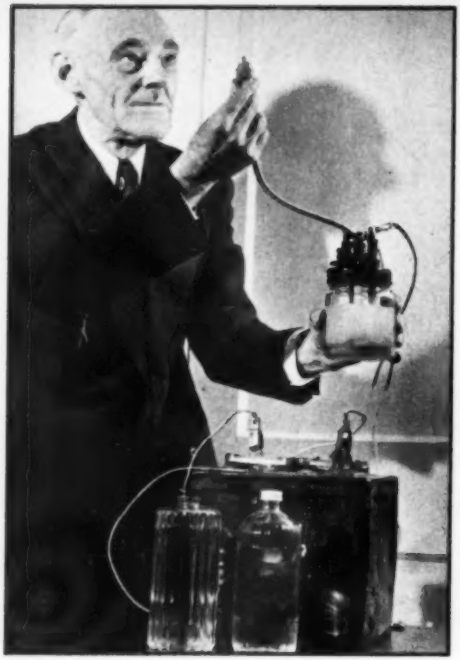
MECHANICAL BRAIN
"WATER" CAR FUEL
WOOD CARGO PLANE
TROOPSHIP OF SKY

## Mechanical Mathematician

PRECIOUS possession of the U. S.' ballistics research lab at Aberdeen, Md., this mechanical wizard works complicated mathematical problems in hours. Previously a corps of men needed weeks to do the same thing. The results of the iron brain's arithmetical prowess add accuracy to American gunnery.

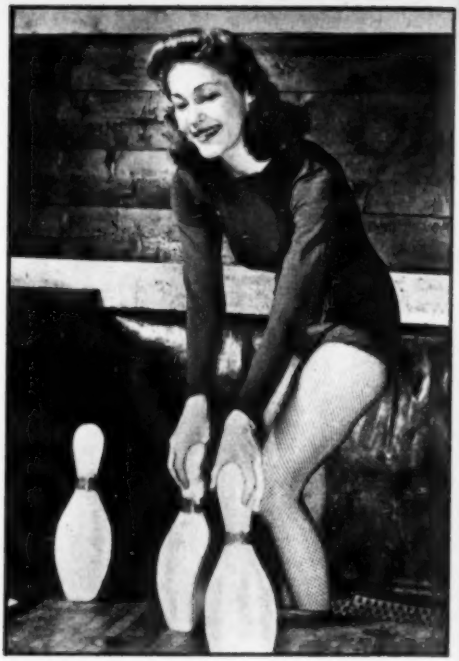
## Molten Metal But Not Hot

CREDIT the liquid, not the man, for his not wincing as he pours molten metal on his hand. It's Bendalloy, an alloy which melts below water's boiling point. It's hot but scalding is likelier from the steaming water in which it's kept, since water wets the hand while the metal rolls right off!



## Auto Fuel From Water

AUTO engines can be cheaply changed to use fuel converted from water, Anthony Morch, N. Y. C., claims. From a bottle of sodium and water, the battery's electricity generates hydrogen which burns with twice the energy of ordinary gas—and costs only 5c a gallon.



## Neat Set Of Pins

FEMININE fingers, nimble at neatness, take over another pre-war bulwark of masculine employment in New York City where pin-girls like the first one, Violetta Weems, 21, above, are replacing drafted youths at setting up tenpins in bowling alleys. Violetta's goal is the stage, though.

## "Galloping Goose" Is Railroad-Auto Hybrid

MOUNTED on flange wheels, this railroad - in - one-vehicle in southwest Colorado is one of four built from 1930 Pierce-Arrow autos to haul 6 to 8 passengers and up to 10,000 lbs. of freight.

Called the "Galloping Goose" it runs between Ridgway and Durango on the Dolores river, is one of only two daily narrow-gauge passenger operations left in the United States.

## Tire With Ice-Creepers

PLANES of the U. S. Army Air Force in Alaska are being equipped with new "ice grip" tires like the one here being examined by Kay Scully, Detroit. Its sharp, cylindrical, crimped-steel inserts make the tread instantly effective on hard snow or glare ice, save wear on rubber.

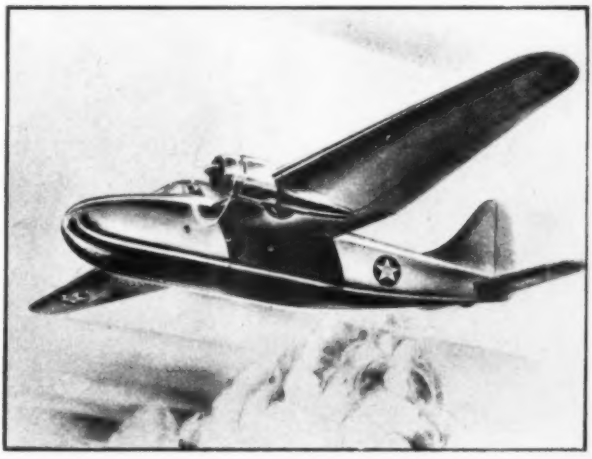
## Marksman With Air

WHEN Roy Wade, movie property man, presses the trigger of this gun, a blast of air with up to 220-lbs. pressure from the attached tank fires a medical capsule of fuller's earth. The capsule burst films like a real bullet striking—but without peril to actors.

---

## Woodworkers To Turn Out New Cargo Plane

WOODWORKERS are building the new Curtiss C-76 military cargo transport plane of wood and other non-strategic materials in Kentucky. About the size of modern all-metal commercial transports, the twin-engined C-76 will utilize a majority of parts built in small assemblies by factories experienced in plywood construction. Details are War Dept. secrets.

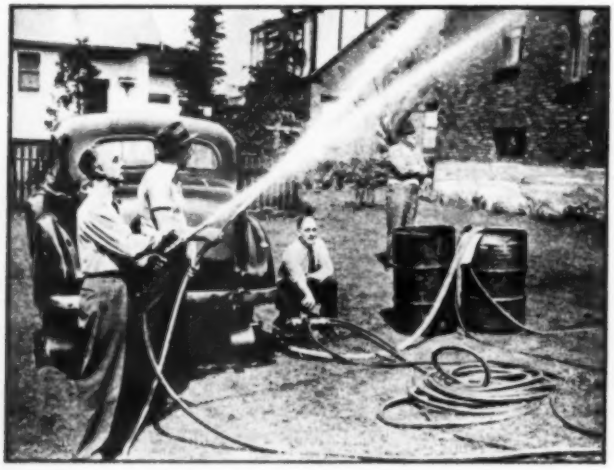


## Splint's Worth A Squint

TAKE your eyes off the girl demonstrating this new splint developed for industrial and civilian first aid, and consider its advantages: it can be used on simple or compound fractures of leg or hip, adjusts to patient's stature. All parts are self-contained in a compact package easy to carry.

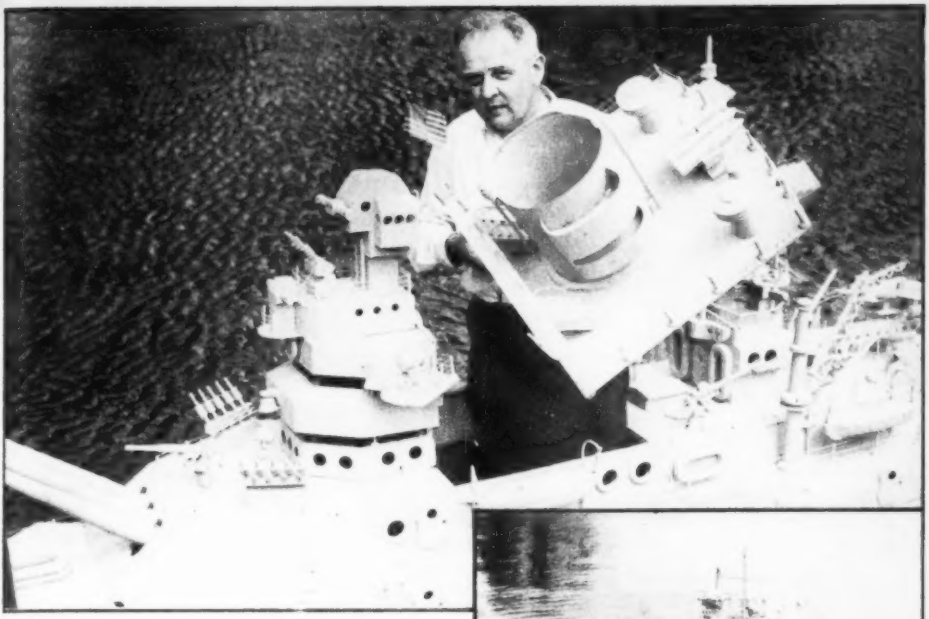
## Blackout Back-Light

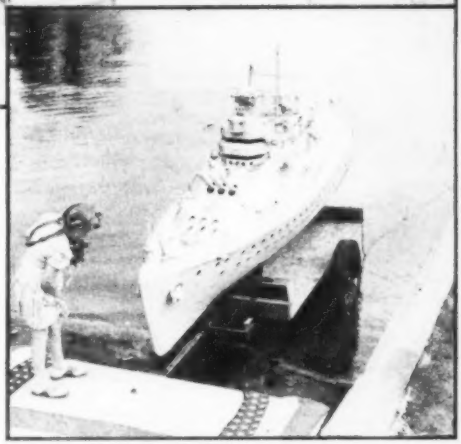
SAFEGUARDS against dangers to cyclists and hikers overtaken by practice or real blackouts while on the highway are among new safety devices. One of them is this fore-and-aft belt with a battery which powers a light on the front of the bike-rider or hiker, and on the back, as shown above.



## Well, Your Car Can Pump Water, Anyway

JOY-RIDING may be curtailed, but keep your auto running for possible use as a portable water-pumper, like this one which Seattle, Wash., may incorporate into its air-raid defense system. The car backs on the pump mechanism, and the rear wheels revolve. Through blocks which contact them pressure is supplied for the hose, which can be from ¾-in. to 1½-in.



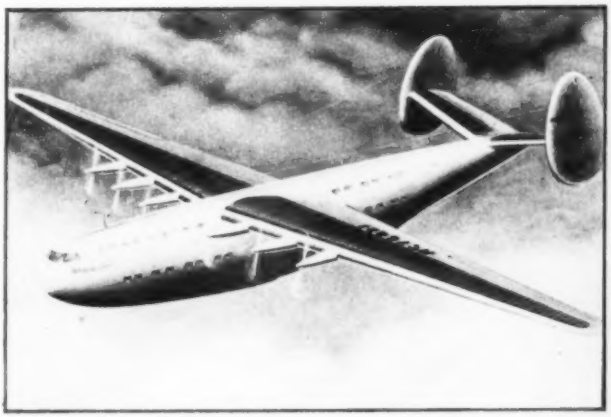


## Man-Sized Man-of-War

ANY model is more fun if you can ride in it yourself. John A. Sargent of Littleton, Mass., figures, so when he designed and built the *U.S.S. Oklahoma* in miniature, he made it 17 ft. long!

He's shown above entering the model for a ride on Sunapee Lake, at Georges' Mills, N. H., after nine-year-old Stella Ann Fleming christened the craft (right) as part of appropriate ceremonies attending the launching of the vessel.

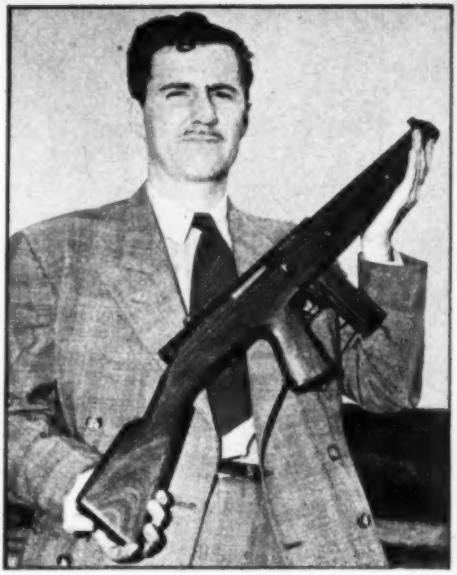
## Flying Boat Would Equal 15-Room House



SPACIOUS as a 15-room house, capable of carrying 102 passengers each having 80 lbs. of luggage, as well as 25,000 lbs. of mail and freight, this proposed new plane would reach London in 13 hours. Glenn Martin's design, it far surpasses the 140,000-lb. *Mars*, world's largest flying boat at present. This view is the first picture to be released of the huge new ship.

## Snuffs Out Bombs

CROSS between a machine-gun and an egg-beater is this device which snuffs out incendiary bombs. Lew Stoner of San Francisco, Calif., shown with the contraption, made it almost entirely of wood in his workshop. It sprays water 25 ft., weighs 2 lbs.

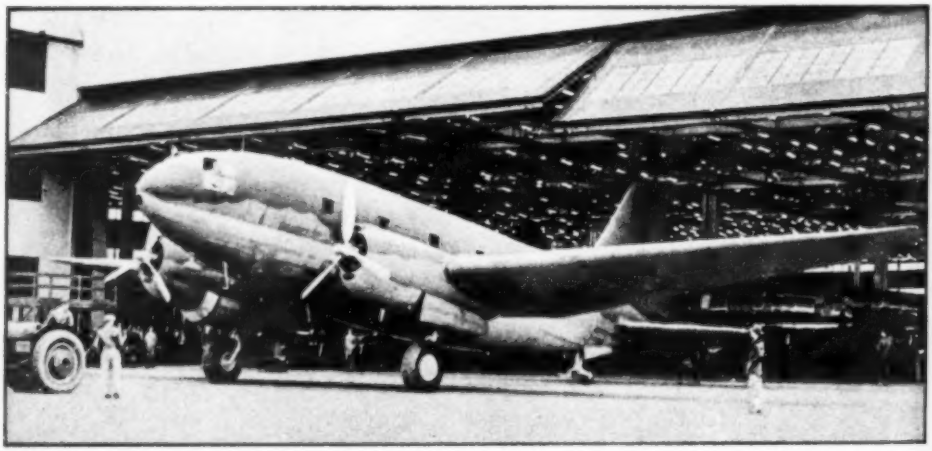


## 6½-lb. Machine-Gun

LIGHTER than any other gun of its type, this new sub-machine gun weighs only 6½ lbs., is only 29 inches long, but can fire 510 bullets a minute. It can be built for under $50, has but 31 parts. William D. Hammond of Los Angeles, above, invented it.

## C-46 Is Army's Troopship of Skies

THE world's largest twin-engine airliner, the new Curtiss C-46 military cargo-transport plane speedily carries troops, field artillery, and reconnaissance cars to critical points in war zones. Being rolled out to undergo extensive taxiing and ground tests, the giant all-metal sky troopship is shown below in the first photo the army released.

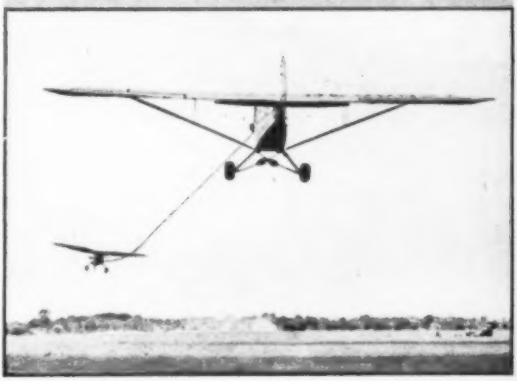


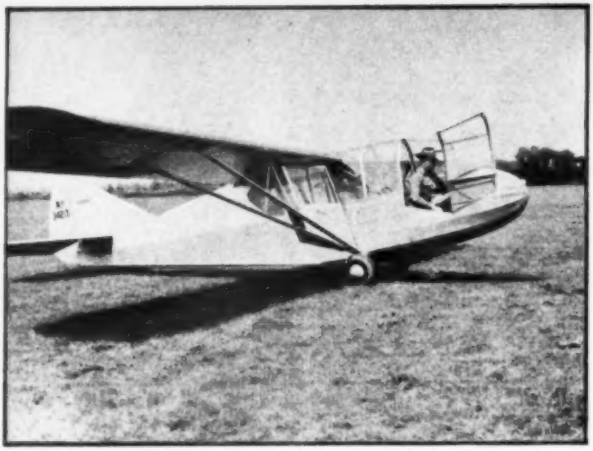
## Plane Jerks Glider Into Air—For Invasion?

PLANE pickups of mail, now routine in 112 cities of the U. S., suggested the idea of a plane in flight snatching a glider into the air—for a possible new invasion technique. As shown here, with a propellerless plane as glider, the usual mail set-up can be used.

The towing plane is shown in the top photo lowering its pickup hook just before hooking the tow rope which is suspended between two poles. A motor reel in the tow-plane reeled in the rope, jerking the glider into the air with a minimum of shock (center photo). Once aflight, the glider was unhooked and continued its motorless journey. The lowest photo shows the tow plane in the distance with the rope slackening between it and the glider as the latter proceeds through the air unassisted.

An army glider specialist has said the new pickup method will greatly speed glider launchings, making it possible to get a small fleet of gliders into the air in a few minutes.



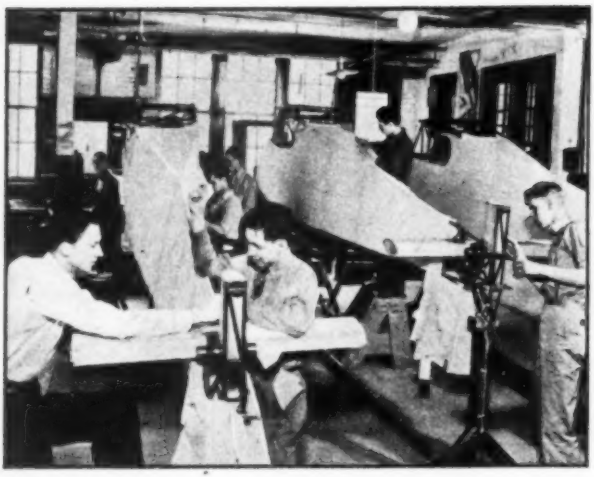


## Motor Out, New Nosed Plane Becomes Glider

USUALLY it takes months even in war time for the designing and production of a new aircraft—but this newly-tested and approved glider was developed in just nine days! Basis is an Aeronca trainer (like the MI contest prize) with a new nose, revised landing gear, towing devices, correction to the vertical fin, etc. Despite the brief time, its tests gained it approval for purchase for the new glider pilot training program.

## Jeep-Mounted Dummy Plane Trains Gunners

ARMY AIR CORPS gunnery students first shoot shotgun shells at clay pigeons, end up drilling a flying target with machine-gun bullets from a speeding plane. In between they practice firing at such targets as this dummy Nazi plane mounted on a jeep. The jeep is driven around a track at high speed, the plane offering a realistic target. Shown is Pvt. G. F. Humphreys of Miami, Fla., on the practice range at Tyndall Field, Panama City, Fla.



## Boy-Built Gliders Will Go To School

MINNESOTA high school senior boys are going to get a chance to build gliders and learn how to operate them when school opens for the fall term this year. That's the program sponsored by the Minnesota Aeronautics Commission.

Here are NYA students building the first of the motorless craft, so they'll be all ready when school reopens. Ted Ballak, holder of the over-water glider record, will direct this unusual state program.

## Shawl Of Death!

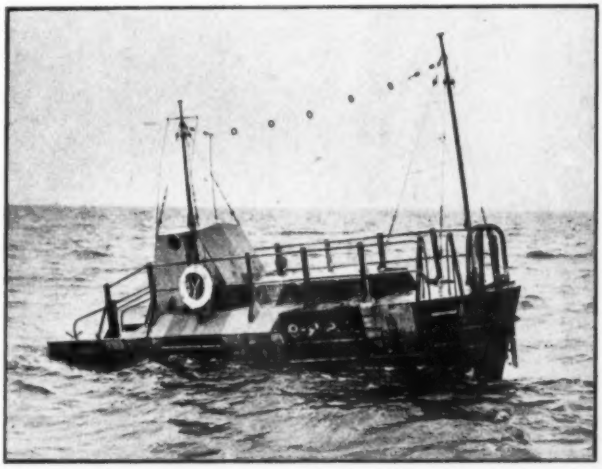
WEARING part of the deadly bullets like a shawl, a U. S. Army Air Force armorer loads the heavy-caliber wing machine-guns of an interceptor-pursuit plane. This view is a close-up of the operation which the armorers in the color photo on the cover are performing.

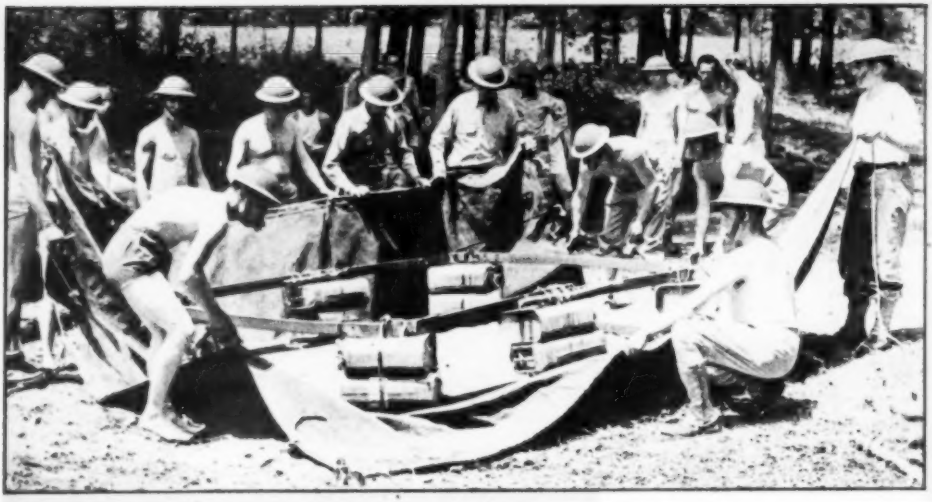
## All-'Round Tank

A DISK-SHAPED tank without vulnerable parts is shown above in model form by its inventor, E. P. Aghnides, Greek-born Belgian engineer. He claims it would be more mobile than an auto, and stronger, speedier than conventional tanks though taking less steel. Its gun would fire all ways

## RAF's Rescue Raft Is Air-Sea Refuge

ROYAL AIR FORCE airmen forced down in the English Channel can find refuge in floating rafts like this one. Moored at various positions in the Channel, the small unmanned craft are fitted with bunks, radio, food, and medical equipment. Should a pilot come down in the vicinity of one, he can reach it with his rubber boat or life-jacket, and await rescue in comparative comfort.



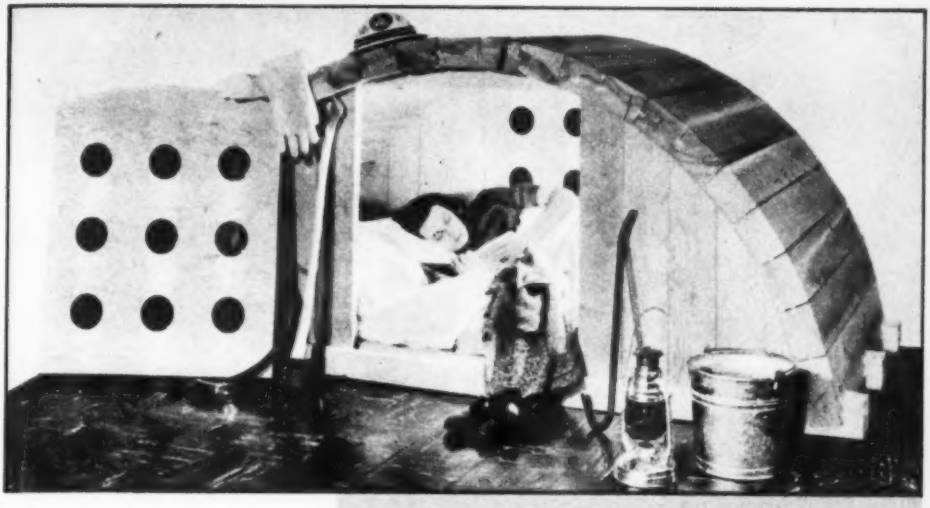


## The Army Wraps Up And Floats Across!

LACKING pontoon bridges or assault boats, army infantrymen get equipment across a stream dry by building "boats" with the framework and tarpaulins from trucks, using water cans as floats (above). A field kitchen can be ferried thus, and even such valuables as communication equipment (left).

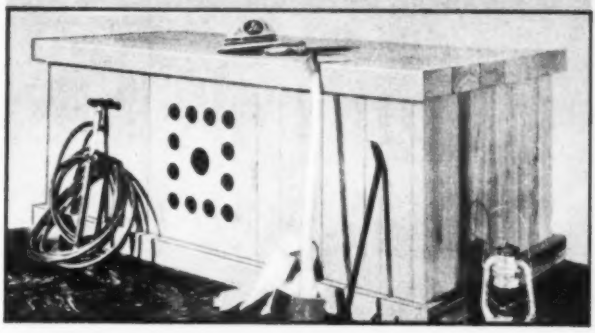
## Elephantine Ears Detect Sound Better

SOUND detection is increased 300% by this headgear that resembles an elephant's ears, its inventors, the three Bayonne, N. J., teachers shown here, claim. Weighing but 2 pounds, the device consists of two brass cups on a cap and fitted so that each side is half a reflecting parabola. An opening in each cup directly over the ear is the focal point of sound. Silk drawn over the cups nullifies wind sounds.



## Shops Show Styles in Air-Raid Shelters

PRIORITY-FREE materials are used in these new home air-raid shelters of timber now on sale. Easily assembled, the arched-roof model above will withstand 10 tons of debris, costs $135. The flat-top type at right will accommodate a twin-bed mattress and other items besides a person, and will support 5 tons; it costs $155.



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## Gun Pointer Wears Dishpan for a Hat

IN FIT and appearance, the helmet on this gun pointer aboard a United States warship looks like a dishpan with a wavy edge scalloped on it just before it was set precariously on the officer's head. Actually, the helmet was specially designed to accommodate earphones, to fit okay, and protect the wearer. He's shielding his eyes from the sun while phoning instructions to the gun crew aboard a U. S. warship somewhere in a battle zone.

## Identifying Aircraft Is Just A Navy Game

WITH this automatic rater, Navy air cadets make a 20 Questions game of testing their ability to identify ships and planes. When a button is pressed, a question card pops up. The player studies it, then presses one of a row of buttons corresponding to a variety of answers. "Correct" or "incorrect" is at once flashed. Scoring is by accuracy and speed of reply.

## Half-Tracked Truck Is Tank-Busting Toughy

CARRYING a hard-hitting, large caliber anti-tank gun mounted to shoot straight ahead, this is one of Uncle Sam's newest war weapons—an armored tankbuster. It's on a half-track and is considerably faster and more maneuverable than the speediest modern tank. Furthermore, it's one of the first with a forward gun.

## Army Builds Model Tanks For The Memory

CHARACTERISTICS of all tanks are being impressed on the memories of the U. S. Army's tank corps so that they can unerringly distinguish friend and enemy during combat. Not only have the men studied charts and pictures but now get three - dimensional visualization from exact scale models moved around a 10x10 ft. realistically-lighted rural setting.

## Filming Elements Speeds Plane Building

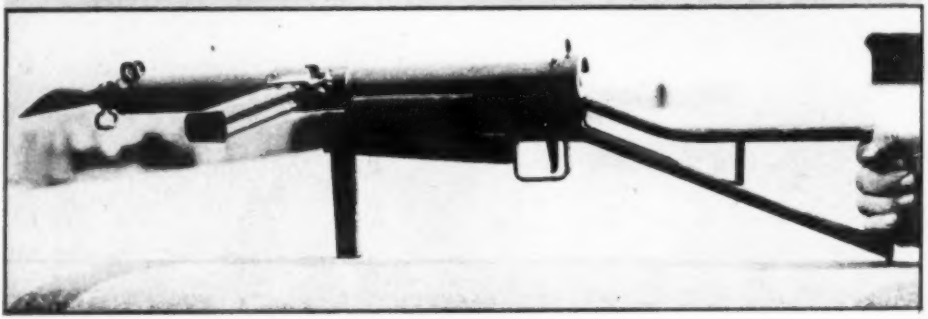
PRODUCTION of warplane engines is sped by the spectrograph's analysis of chemicals. As a sample of material is fused in an electrical arc, a special spectrograph movie film records the light wave lengths given off. The strip of film is projected on a screen inside this instrument at right, a densitometer, and matched with a known reference film.

## Navy Men Learn How To Swim Through Fire

HOW to swim safely through blazing oil and gasoline is a trick now being taught to Navy pre-flight training-school students, tanker crews, etc. Crux of the technique is special way of bobbing up for a gulp of air (left) between long swims underwater. Navy officials figure that if his life is at stake, a man can swim 200 yards under a fiery surface.

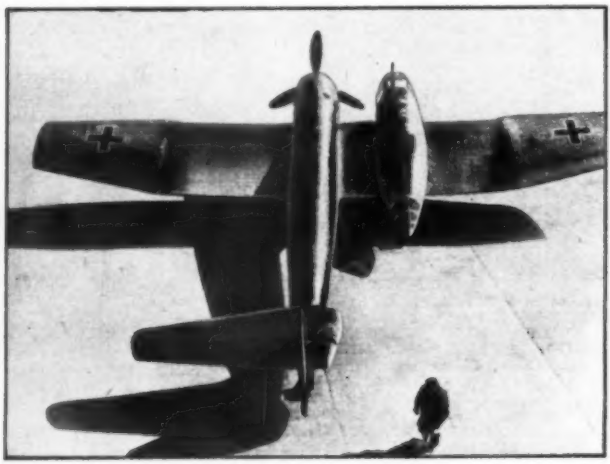
## 'Mystery Tank' Makes Debut In NYC Parade

EYES of spectators at the New York-at-War parade popped when they saw this U. S. Army tank rumbling down Fifth Avenue, for it is of a radically - different design. Official information on its features was withheld but the photograph here reveals that, besides the revolving gun turret at left, the most impressive item of its equipment is the heavy gun of greater caliber than common to tanks.



## Here's The "Dime Store" Tommy-Gun

THIS queer-looking weapon is the new Sten machine gun developed recently by the British. It is being turned out so rapidly in the British Isles that it is known as the "Dime Store Tommy." The folding metal frame used as a gun-stock makes the gun easy to carry in a 'chutist's pack. Note the flash-protector on the muzzle.



## Germans Turn Out A Nazi Nightmare

FROM a Nazi magazine comes this photograph of a weird new unsymmetric plane recently developed by the German Air Force. It is called the BV-141. It has engine in the left nacelle with boom extending to an unbalanced tail assembly. Observation and gun turret for the crew is in the right nacelle. No explanation for the unusual design is given.

# PHOTO SALON —AT HOME

by Will Whitmore

FOR the All-American Bore, many people would doubtless name the amateur photographer who insists on showing his prints to friends and rank strangers. Everyone knows the type. He drags out a big batch of unmounted prints and forces you to look at them just when you have caught the attention of the strange blonde.

And he usually proffers his prints with some such inane remark as "Of course you may not be interested in photography, but I thought you might like to look at a few of my pictures. They're not so good, but . . ."

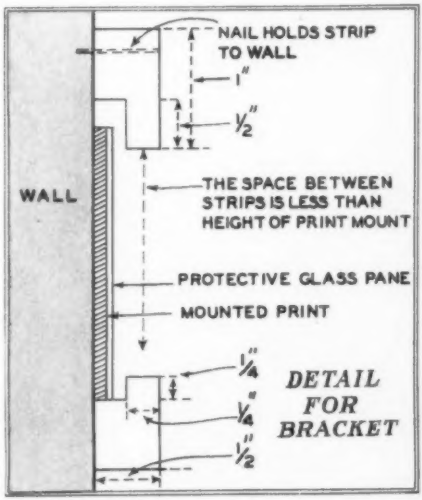
Then, he proceeds to tell you about each and every one of them—just how the sun was shining, and how Aunt Min moved right when he snapped the picture . . .

When I took up photography, I determined I would not become a photobore as well. It's a disease all of us who point cameras at things must fight against all the time. After quite a little thinking and planning, I finally hit upon a scheme which made me bore-proof. I simply exhibit my pictures on the walls of my home in exactly the same manner that exhibition prints are hung in a salon.

The idea works to perfection. Visitors can look at my prints or not, just as they wish. If they want to know more about them, and they usually do, they can ask questions. If they show little interest, then I keep quiet and everyone is happy.

To exhibit my prints, I borrowed an idea from a [*Continued on page* 171]

*Left:* The author and portions of his home salon gallery. *Below:* Construction details of the bracketing strips, in outline. Note that the groove in the upper strip is ½ inch deep and in the lower strip, only ¼ inch—mount and glass are first inserted in the upper channel, then gently lowered into the groove in the lower strip.



# JUST BUGS!

by Victor Brown

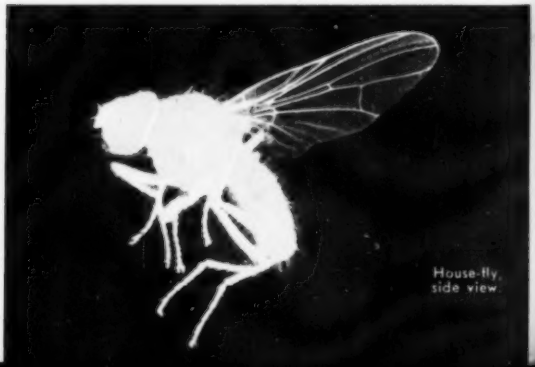
A common gnat with wings spread.

Semi-translucent "silver-fish."

BUGS may be just a lot of infernal pests to the average person, but not so to the amateur photographer who sees in them many fascinating and unusual picture possibilities. However, if he thinks he has to have extension tubes or special closeup lenses for this work, he's misinformed, for enlarged bug pictures, such as in the accompanying illustrations, can be made without either camera or film!

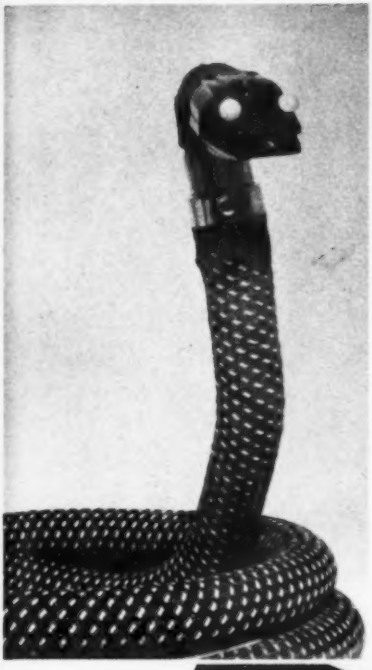
The trick lies in placing the bugs themselves right in the enlarger and projecting them directly onto a sheet of bromide paper. The resulting prints from this procedure are actually enlarged photograms of the bugs which show up the minutest details in greatly magnified proportions. The bugs, which should be dead, are placed on the glass plate (only one of which is necessary) of the enlarger's negative carrier and arranged to best advantage.

Enlargements up to any degree can be made directly from the insects, particularly if they are of the flat variety. However, in order to get the greatest possible sharpness and depth, the enlarger lens should be stopped down to its smallest opening before the exposure is made. Since [*Continued on page* 173]



House-fly, side view.

# PHOTO CONTEST



1st PRIZE

FIRST PRIZE ($10.00): "The Old Spinning Wheel" by Eva Luoma, Hollidays Cove, W. Va. Taken with a Miniature Speed Graphic on Plus X film; f/4.5 at 1 sec. SECOND PRIZE ($5.00): "Loch Michigan Monster" by Robert La Buwi, 628 Twelfth, Oshkosh, Wis. Taken with a Rolleicord camera on Panatomic X, in Agfa 17; f/16 at 1 sec.—2 No. 2 photofloods. Props: Vacuum cleaner hose, electric shaver, thumb tacks. THIRD PRIZE ($4.00): By Richard and Nicholas Greendyk, 123 Struyk Avenue, Paterson, N. J. Taken with a 5x7 Korona View Camera on Defender X-F Pan, in D-76; f/4.5, open flash with two G.E. No. 11 lamps. FOURTH PRIZE ($3.00): "Thrill" by Carl F. Wiegman, 505 E. Pontiac Street, Fort Wayne, Ind. Taken with a National Graflex, Series II, on Superpan Supreme, in DK-20; f/4.5 at 1/500th.

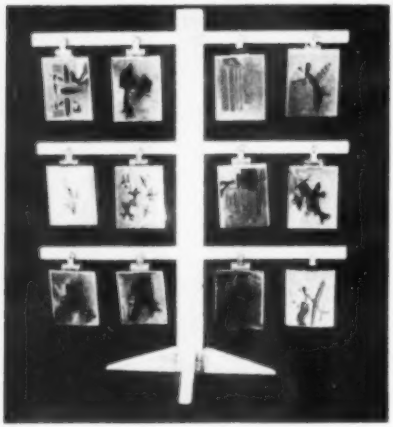
Submit monthly contest print unmounted—no larger than 8x10 inches. Print your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. Be sure to enclose return postage if you want unused prints returned. (Published prints can not be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

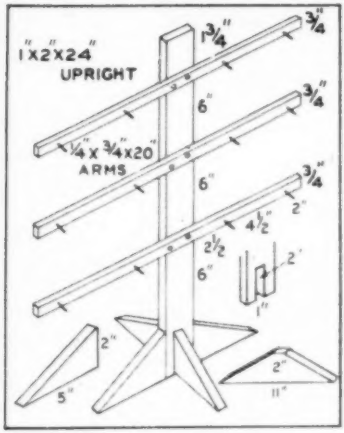
2nd PRIZE

3rd PRIZE

4th PRIZE

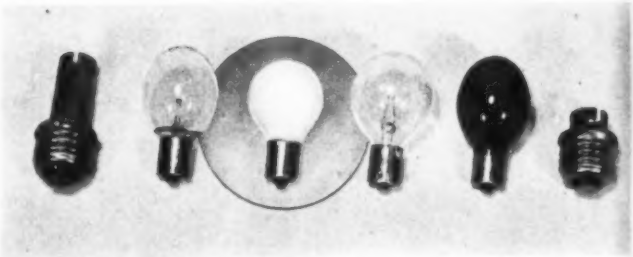
# KINKS AND GADGETS FOR

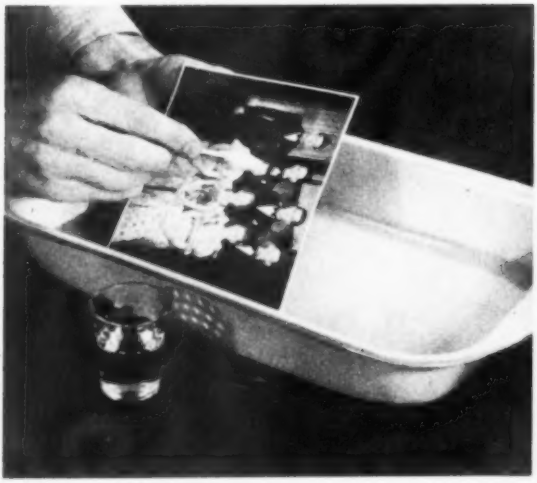





**FILM DRYING STAND** *(left and far-left):* A few pieces of scrap wood cut to the dimensions outlined in the diagram at the left can be nailed together in the form of a tree for drying cut film negatives. The tree can be moved anywhere desired to take advantage of heat or breeze—to hasten drying. Headless nails evenly spaced on the cross arms serve as suspension points for small paper clamps which hold the various pieces of film. The negatives at the far left are backed with paper to make them more visible. *Roy J. Marron.*

**MIDGET FLASH REFLECTOR CHECK** *(right):* Useful in checking the efficiency and positioning of midget flash lamps in various reflectors is the G.E. No. 111, opal glass enlarging bulb (75 Watts) designed for use on 110-Volt house lines with certain 35mm enlargers. Slightly smaller than the various midget flash lamps on the market, the No. 111 bulb has almost identical focus, and has the same single-contact bayonet base. The No. 111 can also be used for auxiliary spot lighting effects when mounted in a concentrating midget flash reflector. *Philip B. Sharpe.*

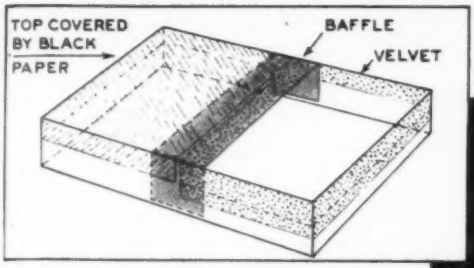




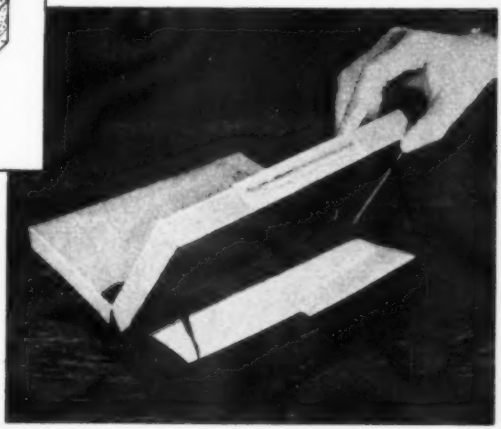
**LOCAL ACCELERATION OF PRINT DEVELOPMENT** *(above):* Highlight areas of prints which are insufficiently exposed to the printing light may often be kept from remaining blank white by the application of full-strength developer after general development has progressed half way. The applicator can be a matchstick with a tuft of cotton wrapped around its end. The developer can be kept in a small jigger. *William Swallow.*

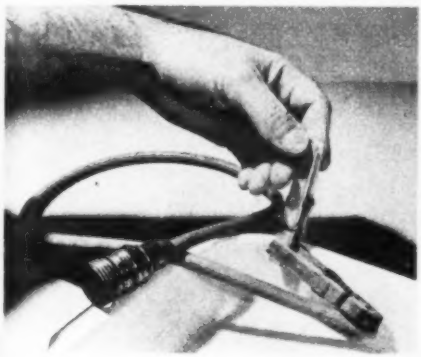
*Below:* Clamp-on lighting units can be kept from slipping on a vertical support by placing a U-shaped clothes hanger wire through the jaws of the clamp—the upper part behind the post and the lower, in front of it. The tension holds it secure. *Louis Tochman.*

# AMATEUR PHOTOGRAPHERS

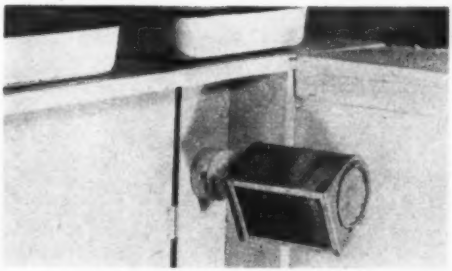



**PAPER SAFE.** The handy, light-tight paper safe shown below can be made by lining an 8x10-inch gross-size printing paper box with black paper and making the hinge arrangement diagrammed at the left. Strips of velvet glued around the opening make the box light-tight. *Brian A. Loveridge.*



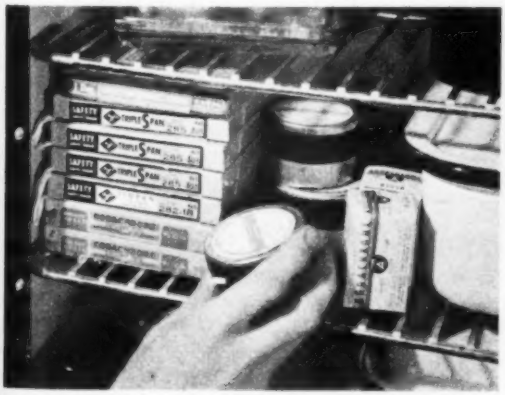


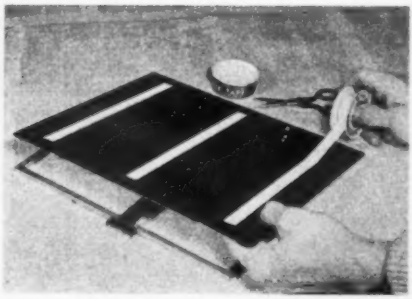
**PRINT WASHER** *(left):* Prints can be whirled in washing by arranging the inlet hose with two spring clothespins so that one of the latter pinches off the end of the tube, narrowing the water stream, and, the other holds it to the tray. *Ken Murray.*



**FILM REFRIGERATION** *(below):* All films can be preserved beyond the expiration date without trace of "age fog" by keeping them in the cold, dry interior of the electric refrigerator—the technique recommended for Kodachrome during the wet hot months of the year. However, be sure to remove film several hours before use and let it stand at room temperature—to avoid condensation of moisture on the cold film surface. *W. A. Conway.*

*Left:* Darkroom fumbling can be minimized when films are developed in "total darkness" by keeping a small dim safelight under the worktable so that it casts all its rays under the table without illuminating the bench top where it might fog the film. The green Wratten 3 safelight will do for panchromatic film and a deep red No. 2, for fast ortho. *A. J. Lockrey.*





**NON-SKID EASEL** *(above):* The enlarging easel can be kept from slipping around on the enlarger baseboard or table by taping adhesive or fire tape on its bottom side, as illustrated. *George Carlson.*

# DYNAMIC PATTERNS by "OVERPRINTING"

by Tracy Diers and Lester Krauss

SHOULD a print be correctly exposed in the full technical sense of the word? Should the "correct" contrast grade of printing paper be used all the time?

These are questions which are bound to come up at times in professional and amateur photographic practice alike. The answer is simple.

There is no exact exposure for each individual negative nor is there necessarily a strict rule to follow for matching paper contrasts to negative contrasts. This may sound a bit revolutionary if you are a purist but it is the key to much of photography's effectiveness as a medium of self-expression.

Each print has a certain point beyond which it is called "overexposed" and before which it is called "underexposed." The average "nice" print, falling on the mean, is quite conventional.

What happens if a mediocre print is exposed beyond the point which our experience would call the logical norm? What happens if, in addition to overprinting, we deliberately choose a paper contrast having a hardness quite in excess of that required to match the negative gradations? Interesting effects often result; the truth of this is attested to by the accompanying illustrations.

The casual street snapshot at the left is invested with importance and mood by overprinting *(left, top)* which accents masses and subdues small detail.

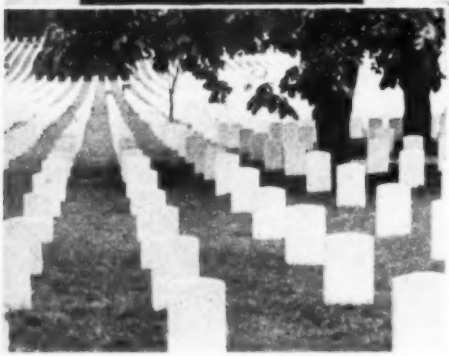
The glowering print at the right was printed on the same "normal" paper as the scene above, but the 15-second exposure was prolonged to 45 seconds, accenting the masses.

After scanning these shots one's first impulse might be to print every picture as dark as the various overprinted examples. But, it doesn't always work. Only certain carefully-chosen subjects can be submitted to this process with the purpose of converting them from snapshots into pictures.

The type of subject material that readily lends itself to this sort of treatment is that in which there are large solid masses. Typical is the street scene on page 98, which is presented in its normal aspect as well as in its overprinted form. The latter is an excellent representation of an oncoming storm, just as the last rays of the sun slip behind the clouds to make way for the deluge. Note how ineffectual the massive buildings appear in the normal print and how suppression of the foreground detail contributes to the forcefulness of the impression in the other result.

The "normal" print was made on the No. 0 grade of a particular contact paper, exposed for 10 seconds. The dynamic print was obtained by exposing for 30

*Left:* Overprinting on hard paper (No. 3) rescued the shot above from the waste can. Notice the fiendish Machiavellian effect the eyes take on.



The print at the left was exposed according to the rules—a perfectly normal, average effect. Overprinted (above), the scene begins to take on significance. Note the pattern formed by the patches of white against the soft black ground.

seconds on No. 4 paper of the same brand. Prolonging the exposure without increasing the paper contrast would have blocked up the shadow detail and muddied the highlights as well. As it is, the effect is bold and crisp.

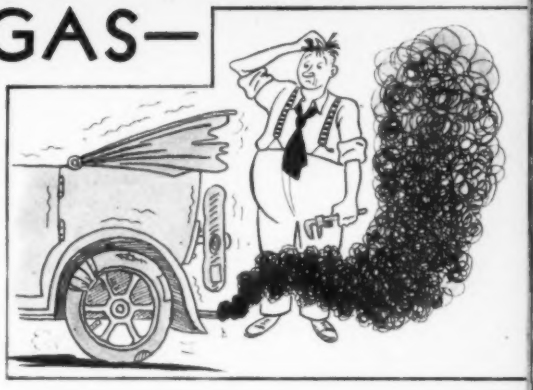
Carefully examine each of the other examples of overprinting and see how the technique has improved the effect. In the case of the water scene at the top of page 99, it was only necessary to increase the print exposure on normal paper to secure the desired dramatic quality. This was so because the original negative was quite contrasty in itself, as backlit subjects generally are. The highlights on the negative were originally quite dense and would print white on almost any grade of paper, over a considerable exposure range.

All but one of the accompanying examples of overprinting were prepared from normally-exposed negatives, so that it was possible to show the normal, fully-detailed print and the dramatic pattern representation by comparison. The single exception is the man at the typewriter, at the bottom of this page, which was considerably underexposed. The overprinting technique served to blacken the shadow detail that [*Continued on page* 173]

The scene at the left was "overprinted" from an underexposed negative; it wasn't necessary to kill shadow detail as in the other examples—merely, print the shadows a good rich black.

# NO MORE GAS—

## *but you don't need it anyway!*



THE chances are that you can get your car running on kerosene quite satisfactorily. However, if you're a fuss budget with a car you're still paying for, don't try it. You'll have to get your hands dirty, and you should have at least a vague idea of how and why an automobile engine runs.

The older cars (up to around 1931) are usually the easiest to run on low grade fuels. The newer cars can be converted too, but it's a little more trouble. Then too, if you can afford a new car, you can probably afford a taxi when your gas ration runs out.

But to get down to the business of running your car on kerosene and such—. It won't hurt you any to learn something about the difference between gasoline and kerosene. One way to do it is to take two saucers, and put about a quarter inch of kerosene in one and the same amount of gasoline in the other. Then go out in an open lot and throw a lighted match in each of them. Usually the match goes out when it hits the kerosene, whether you believe it or not. On the other hand, the saucer of gasoline may set fire to the lot and you too. So be careful.

To make kerosene behave reasonably like gasoline you have to heat it. If you're silly enough you can prove this to yourself by boiling a potfull of kerosene on the stove and then throwing a match in it. If the house is insured you can have one swell time until the cops and the keepers catch up with you. But that's neither here nor there.

It does illustrate the fact that in order to make kerosene ignite properly, you must heat it. The same thing is true in the engine of your car. The gasoline is ready to burn without any pre-heating, but the kerosene is not. If you take

[*Continued on page* 169]

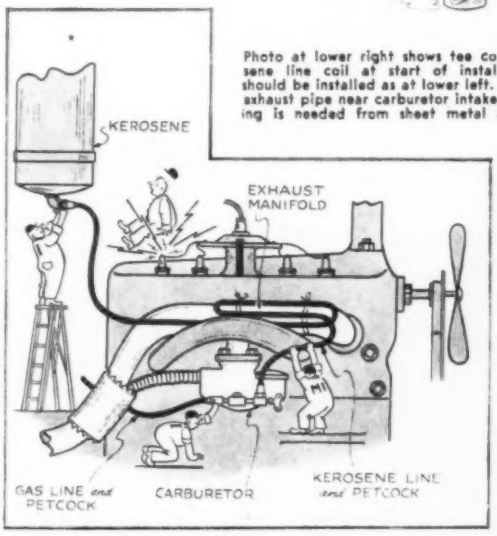



Photo at lower right shows tee connection and kerosene line coil at start of installation. Air heater should be installed as at lower left. Some engines have exhaust pipe near carburetor intake so no flexible tubing is needed from sheet metal air-heating jacket.

# LEON AND ICKLE, THEY RUN

**A few jiggers of gas will take you to town in Leon or Ickle—the ration twins, and they're easily built!**

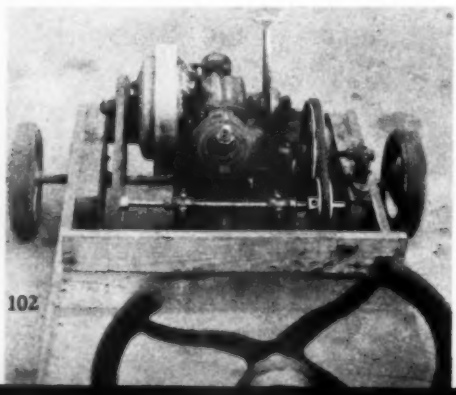
AUTOMOBILES

View at left shows X-brace in frame of *Leon* and V-pulley steering. *Below:* Checking 10 lbs. air pressure in the scooter wheels.

by Paul Cain

TWO Georgia amateur mechanics, F. E. Smith of East Point, and Robert Jopling of Augusta, have licked the current problems of automobile transportation by the most direct attack: they've built miniature cars of their own. Both cars were constructed of odds and ends of material, and at a minimum of expense. Both were built on a "catch-as-catch-can" plan, with no blueprints or mechanical instruction—the boys just made up the simplest design possible as they went along.

The two home-made cars present an excellent cross-section of the possibilities of home craftsmanship in this line, each being a good example of a different approach to the job. Smith's car, *Ickle*, is a somewhat more advanced and professional a model, and cost more to make than did Jopling's, which, though, equally efficient, is a much simpler job in body and mechanism. The approximate overall cost of Smith's car was $75; Jopling's cost $41. The costs include all parts, all of which were obtained from hardware stores or junk dealers. Construction time for both cars was spare time for about two weeks, representing perhaps forty hours total.

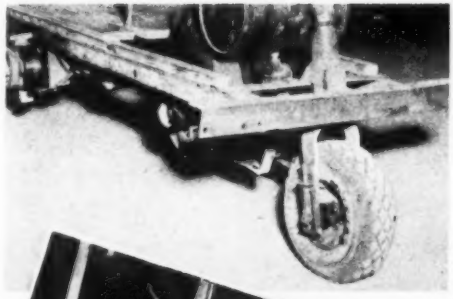


Smith's is an "all-steel body" job, the body being composed of four lengths of angle-iron, taken from an old bedstead. Two pieces 30" long compose the ends, the length being approximately 48". The irons were welded together.

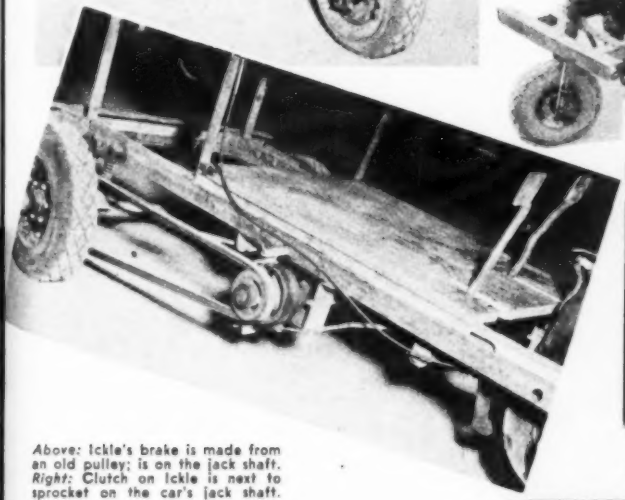
The prime mover of *Ickle* is a ½ h.p., one cylinder gasoline engine, taken from a power insecticide spray. As the engine formerly

Washing machine motor and forward jack shaft set-up on *Leon*.

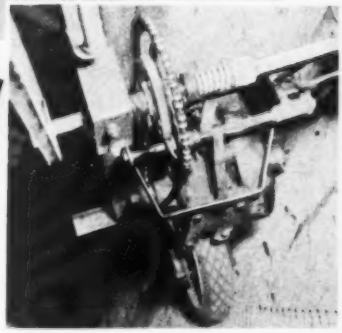
# ON A TRICKLE



Heavyweight Smith (right) does 12 m.p.h. smoothly on Ickle due to clever front springs and similar rear ones.

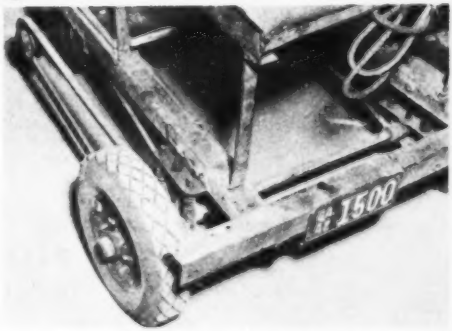


*Above:* Ickle's brake is made from an old pulley; is on the jack shaft. *Right:* Clutch on Ickle is next to sprocket on the car's jack shaft.

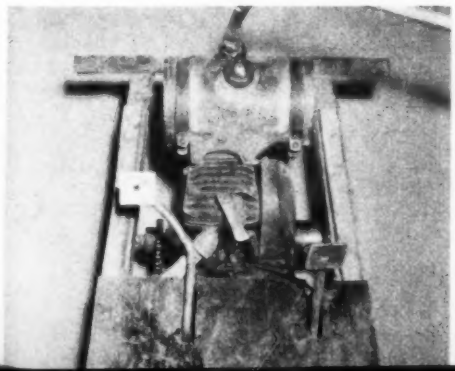


Rear springs and seat struts on Ickle. Though light and simply constructed, car is rugged.

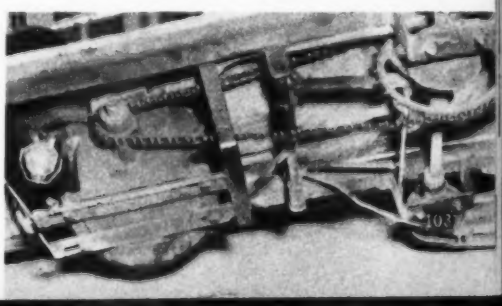
was directly connected to the compressor on the spray, it had a short drive shaft exactly suited for this adaptation. It is located at the front end of the car, suspended between the body irons by twin engine supports, consisting of iron straps welded to a cross-bar at the front, and joining another cross support at the center of the body. This suspension locates the drive shaft at exactly the right level for the transmission [*Continued on page* 121]




Forward on Ickle. Clutch and brake pedals are aft of engine.



Ickle's underside (below) shows engine supports, sprocket, clutch, and brake, and cross shaft that carries foot pedals.



# COMPOUND MICROSCOPE

**Do you want a microscope, but feel that you can't afford one? Well, here's one you can afford, and you'll find it useful for serious research as well as light entertainment.**

by Walter J. Burton

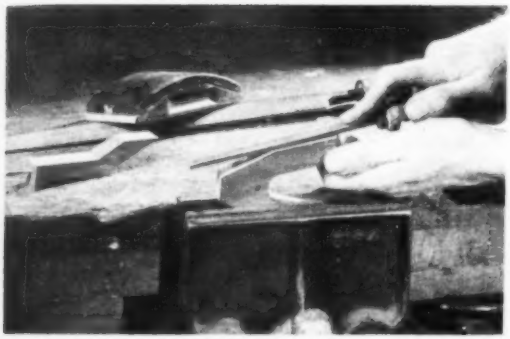
DRAGONS inhabiting a drop of stagnant water, the ingenious hooks on a honey bee's wing, the orderly arrangement of cells in a bit of wood . . . such are the marvels of the microscopic world that can be seen with a compound microscope anyone handy with tools can make. The cost need not exceed a dollar or two, because material for most of the parts can be found in the scrap box.

Directions for making this interesting instrument divide themselves naturally into two parts, construction of the stand and the optical system.

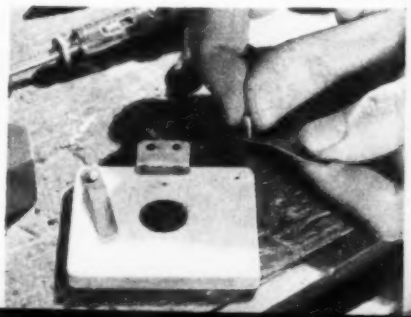
This compound microscope was made largely from odds and ends. Objective lens is a glass bead, and eyepiece is the lens from a tripod magnifier costing 75 cents.

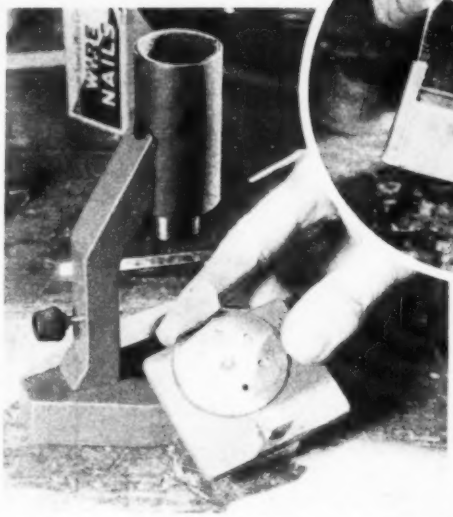
*Right:* Photomicrograph of the hooks on a honey bee's wing, taken through the glass beads objective, no eyepiece being used. Magnification about 750 dia.

*Below:* The plywood stage, showing mounting bracket of spring metal and the two spring slide clips.

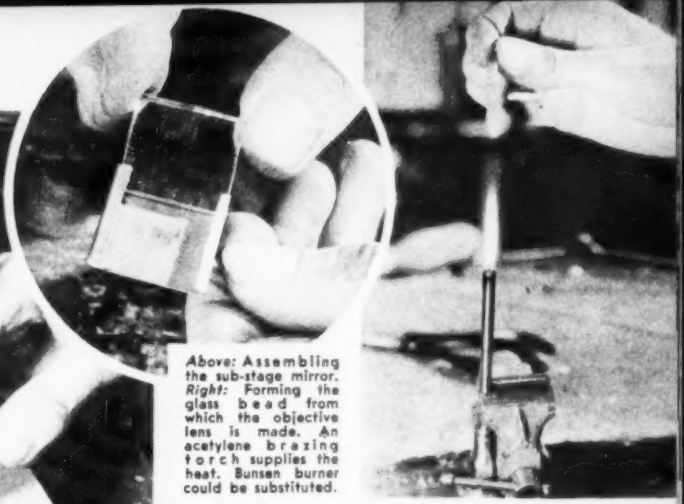


*Above:* Making the stand. Walnut, maple or other hard wood is used. Cutting can be done with an ordinary saw and auger bit.

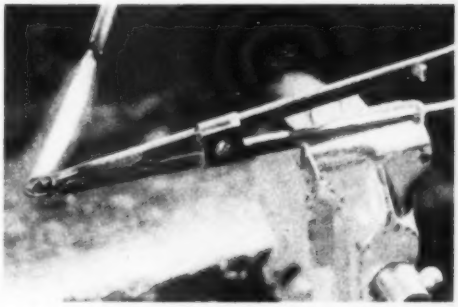





Beneath the stage is the rotating disk for controlling the amount of light reaching the slide. The felt-lined microscope tube sleeve is shown. Wooden parts of stand are lacquered.



*Above:* Assembling the sub-stage mirror. *Right:* Forming the glass bead from which the objective lens is made. An acetylene brazing torch supplies the heat. Bunsen burner could be substituted.



The bead is broken off and laid over a hole in a metal disk. Further heating causes the glass to take a spherical form.

The disk carrying the lens is cemented to a mounting made from an ordinary spool. This piece slips into lower end of tube where it rests against cardboard shoulder.

*Right:* These small, inexpensive lenses, mounted in metal sleeves, can be used as objectives in place of the glass bead.

The stand will be considered first, but a few words about the lenses will not be amiss here. There are several types of lenses you can use. The objective lens at the bottom of the tube can be a drop of water suspended in a small hole in a metal disk, a glass bead made with the aid of a gas flame, or any of a wide variety of small glass lenses and microscope objectives obtainable from various sources. As for the eyepiece, a 75-cent tripod magnifier or a standard microscope ocular is best, although one can be made by mounting a small, short-focus magnifying glass at the upper end of the microscope tube.

The microscope stand has been designed so it can be made with a saw, file, sandpaper, and the other tools commonly found in the home. The base and upright or post are made of walnut, maple, birch, or other wood that is not too soft or easily split. Cut the base and upright as shown in the drawing and fasten them together by a single flat-head wood screw passing up through the base and into a hole drilled in the post.

These wood parts can be finished with any conventional material, lacquer being excellent.

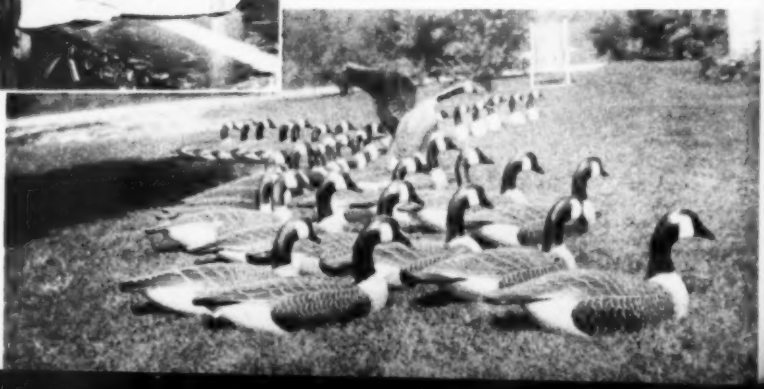
The stage or part that supports the slide is made of plywood $\frac{3}{16}$″ or ¼″ thick. It is 2½″ long and 2¼″ wide, and has a ½″ hole bored in its exact center. [*Continued on page* 117]

# Fifth Column

*Left:* Steven and Lem Ward, Maryland barbers whose lifelike decoys are used by leading sportsmen of the country. *Right:* A corner of the Ward workshop, where the masterpieces are produced with simple tools. With care, Mr. Average Sportsman can make excellent decoys himself.

by Edwin J. Becker

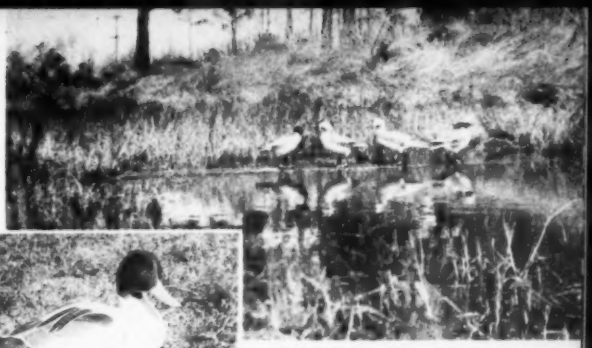
IN A historic little town on Maryland's famous Eastern Shore, two brothers—Steve and Lemuel Ward—have been sawing, whittling and painting decoys ever since they had enough leg under them to fall over the piles of 'coys their boat-building dad carved out in his spare moments. And what the Ward Brothers have made an art of can be done by anyone interested enough to take the time necessary. And it doesn't require a great deal of that. I have made decoys per Ward formula and have made them so realistic the ducks themselves can't tell them from the real things. Decoy making is something that falls in line with the Government's

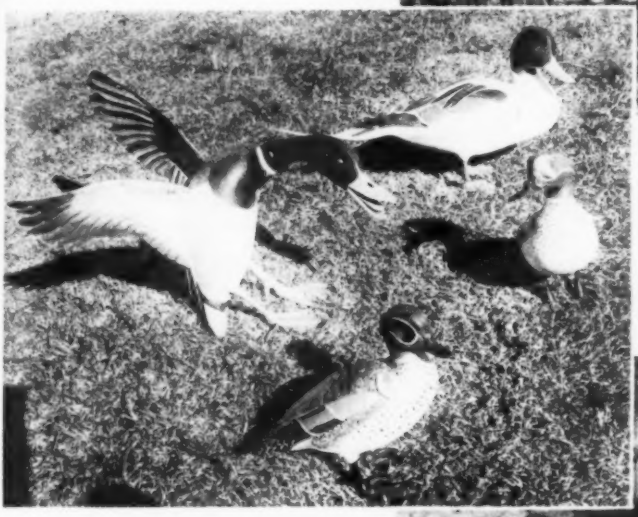


Lem Ward cuts out a decoy pattern from a cedar block—best wood for the purpose. Note notch at neck for firm seating of head. *Right:* A squadron of Canada geese ready to go to work.

# For Ducks

**Patience and penknife are the main tools needed to carve Quack Quislings that will really fool the fowl.**





*Above:* Don't throw off the safety catch—those are only decoys!

*Left:* Mallard, Pintail and Wood Duck decoys show realism possible in the decoy art. Beginners should attempt only flat-bottom models.

*Below:* Lem Ward displays Pintail and Mallard floaters. Color scheme should be obtained from pictures, or from observation of the duck itself.

civilian morale program, too. Hunting and fishing have been deemed essential in war time and that means there'll be ducks to be taken, comes the open season. Now's the time to make your decoys and have them ready to set out when the ducking season opens. And if you don't shoot ducks make decoys anyhow—they're darn nice ornaments!

First, as to tools. You don't need a tool kit—you need only a bandsaw, hatchet, spoke shave, vise, penknife and rule. And that's all. Paints and brushes come later.

Your basic material is wood, and as the Ward Brothers' long experience has proven, there's really only one kind of wood suitable for decoys. Cedar wood. This is the best wood that can be obtained. Balsa wood is sometimes used but it does not give the service that cedar gives. When made of cedar the action of the decoys on water is perfect—they bob up and down as do real ducks as the bottoms are perfectly flat. Lem Ward says: "Sportsmen do not have to tell me how ducks act to them. I have had the real ducks among these cedar 'coys and no man could tell them from the decoys until the ducks moved."

So don't experiment with other woods. From long experience cedar has proven best—and is best.

Your first job is to make two paste board patterns to conform with the outlines shown in the drawing (side view). When you have your patterns made to your satisfaction, outline the side pattern on a block of cedar 12" long, 7" wide and 4" thick. On the flat side of the block trace [*Continued on page* 120]

# HOW TO BUY A

**Some tips on getting your money's worth in a second-hand sporting weapon.**

*Left:* A simple method of weighing a trigger pull. Tie a known weight to the trigger and lift gently with the empty gun cocked. In this test the hammer just fell after lifting a 3-pound box of shotgun shells. *Right:* Check shotguns for wear in the breaching this way. Twist the gun. There should be no play or looseness.

by Philip B. Sharpe

VERY few sporting firearms are being manufactured today. All new guns—rifles, revolvers and shotguns, are "frozen" in the hands of dealers. All of which means that your chance of buying that long-desired new gun for target or sporting purposes will have to wait "for the duration."

The fact that there are no new guns available no more decreases the demand than the freezing of new auto tires. Sportsmen have always wanted guns. Most of the boys want new weapons. Many always intended to buy but couldn't with their tight budgets before the war. Increased income has made the purchase possible—but now they can't buy. Thus these hundreds of thousands of sportsmen must turn to the used market for additional equipment.

There is no better way to get a real dollar value than in a used gun—and no easier way to get thoroughly trimmed if you don't know how to buy.

Step back, for a moment to "olden times"—in the year 1940. A chap bought a new rifle for $50. After a few months and a box or two of ammunition, he decided that it was not what he wanted. If he wanted to buy a different $60 grade gun, his dealer would probably allow him about $35 trade-in for his like-new $50 job. Or he would sell it privately and probably get $40 for it.

If that gun had been treated properly, the buyer would have a gun for all practical purposes as good as a new gun—and at a saving of $10 or 20%. Thus he would get more for his money than the man buying a new gun.

Today, with new guns impossible to get, the used gun market is thriving. And each day that passes, dozens of chaps buying a used gun have been neatly trimmed. The writer does not imply that the seller is dishonest in the majority of cases—many times he doesn't know the condition or value of his own equipment.

If you plan to buy a used gun, do not be hasty. Many a gun that would have sold in 1940 for $25 has had its price hiked up to $50 today. Yet it is no better than it ever was.

Just because a gun *looks* good is no sign that it is a good buy at any price. If it needs repairs, *don't consider* it. Few factories can undertake any form of repair work on their guns due to military obligations—and a private gunsmith's work is very expensive.

*Never* buy a gun if the manufacturer is no longer in existence. It is probably old, unsuited to modern ammunition, unsafe—and you can't get repair parts.

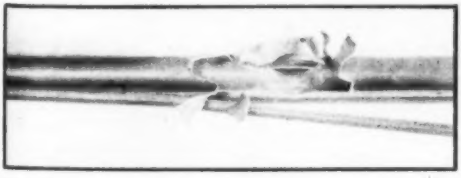
# A USED GUN

Hinge pin wear is easily detected in a shotgun. Break it open and twist as shown above. It should be tight, with no play.

How can you be sure that the manufacturer of the gun you propose to buy is still in business? Visit any sporting goods store and ask the manager of that department. If no store is available, the firearms editor of any sporting magazine will tell you if you enclose a stamp in writing him.

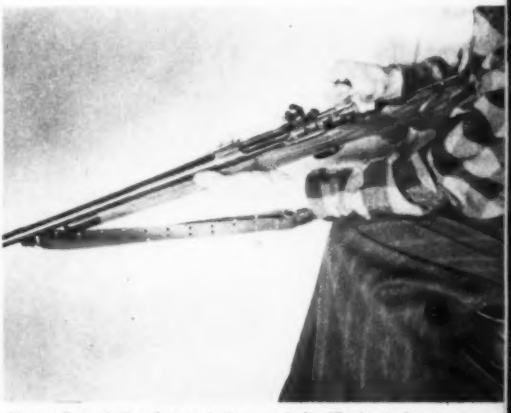
If you are not certain, and plan to spend $20 for that gun, make a cash deposit of $1 to hold it while you check up. If you do not buy, you lose the dollar. That's better than losing twenty. Get a receipt and have the seller agree in writing to hold the gun for you for three weeks. Have him put the make, model and serial number on your receipt.

If the gun is a standard make, be certain that it is not an obsolete model or a current model for a discontinued cartridge. If you can't get the ammunition, you do not want that gun. You'll just have a white elephant. Little sporting ammunition will be loaded for the duration of the war. Afterwards you will see the discontinuance of many old cartridges which have long [*Continued on page* 149]



On bolt action rifles check for play of the breach mechanism with the fingers, and with the gun cocked. Play means *danger*.

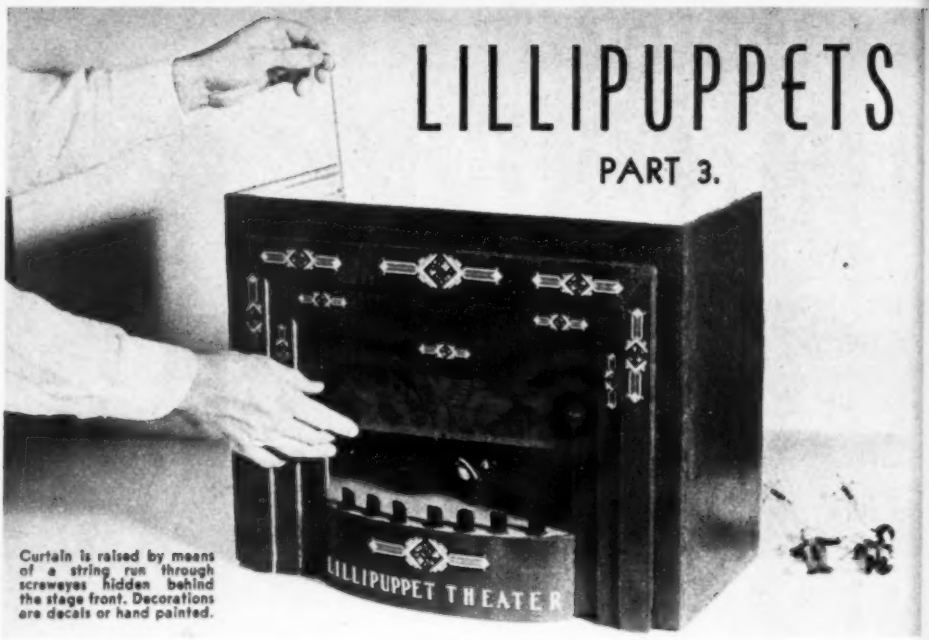
Is that gun safe? See if you can force the hammer to fall as shown. If you can, gun is dangerous, may go off unexpectedly.



*Above:* Repeat the danger test on a bolt rifle by trying to force the striker down. *Left:* This shotgun killed a man. All that is left of a pair of barrels of a cheap and ancient gun.

# LILLIPUPPETS

## PART 3.




Curtain is raised by means of a string run through screweyes hidden behind the stage front. Decorations are decals or hand painted.

**Building the stage for Lillipuppet shows.**

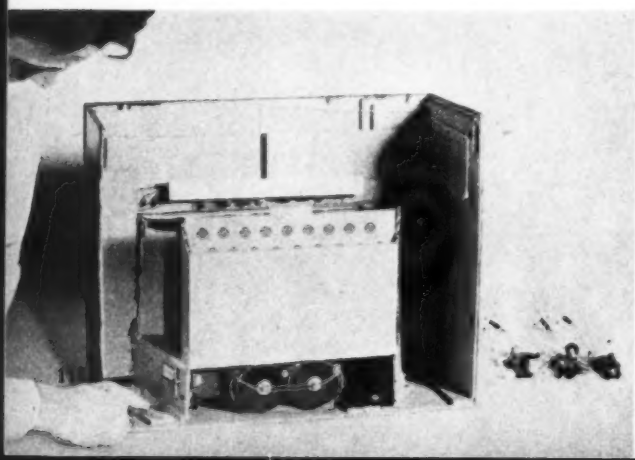
by Leslie P. Guest

A LILLIPUPPET Theater may be quickly, simply and inexpensively made. Almost any box or carton may be cut so that it has no top or back, and a proscenium arch, or stage cut into the front. However, a very attractive yet practical and inexpensive theater can be made in a few evenings by following the simple directions and illustrations herewith. The only tools used are pencil, ruler and sharp penknife. The only material, corrugated board cut from shipping cartons, glue and plastic wood.

Corrugated board is surprisingly strong, considering how easily it may be cut, trimmed, bent and fitted. Its strength is demonstrated by the fact that it is used for the shipping of quite heavy merchandise, and it is only weak where there are exposed edges and unreinforced bends and joints. And these, weak spots may easily be reinforced with plastic wood. The finished theater is quite light, and just about as strong as if made with plywood or other heavier materials.

Follow the dimensions given in the sketch, or make the theater larger if you wish. You can make it smaller—in fact, the writer's first Lillipuppet Theater consisted of a cigar box. The trouble is that too small a theater does not give the hands room to move about in manipulating the figures.

If you can secure a large shipping carton or flat sheet of corrugated board, the entire theater may be made in one piece. It should have a bottom,

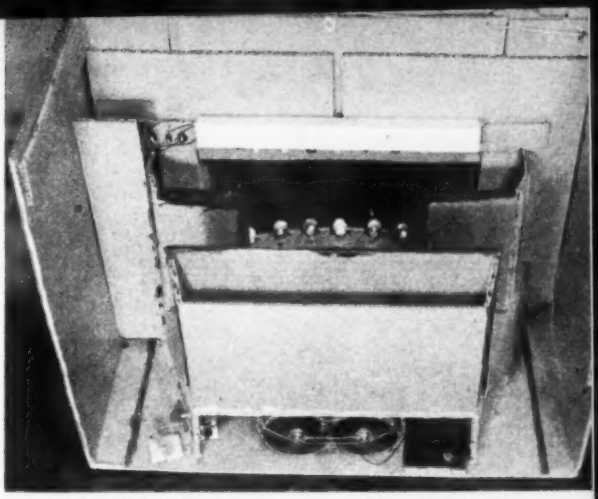


Backstage. Finger points to music box control. Light switch is at right of the batteries.

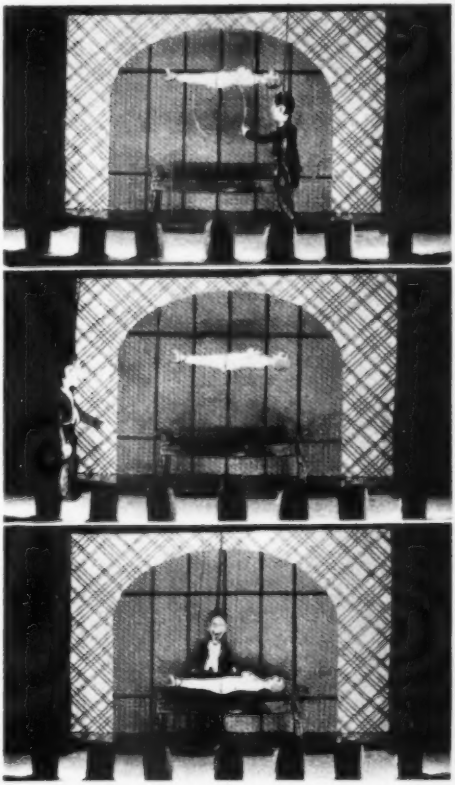
sides, and front, but no back or top. Tabs for fastening should be bent into place, and the framework of the theater glued together. The curved front of the stage may be omitted if desired, but it is very attractive, and worth the small additional time and trouble required.

In making the theater frame, include the curved front on the bottom. Later when you make the raised stage floor it should have the same curved front extension. Then to these two curved edges you glue a front piece of corrugated board which has been worked between the fingers until it is soft enough to bend following the curve. Cut the proscenium arch in the front 10" wide and 9" high, the height representing the stage opening plus the height of the raised stage. The raised stage is made separately and then glued into place. The photos and sketch give the general plan. The stage is wider at the front than the proscenium arch. Then it slopes in toward the back.

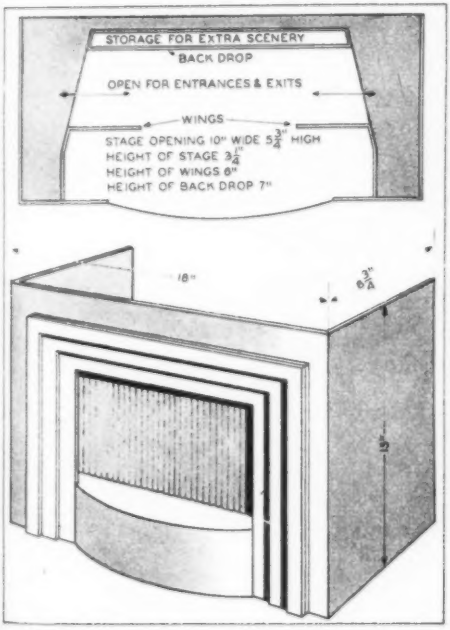
The front portion of the stage is boxed in by side walls and wings 6" high. The back wall of the stage, or "back drop" is 7" high, and is made in the form of a box about an inch thick. This box [*Continued on page* 163]



Details of backstage construction and layout are shown clearly in above photo. Cord for raising curtain is at right side; footlights and toplights in center are wired in series, like a Christmas tree colored light string.

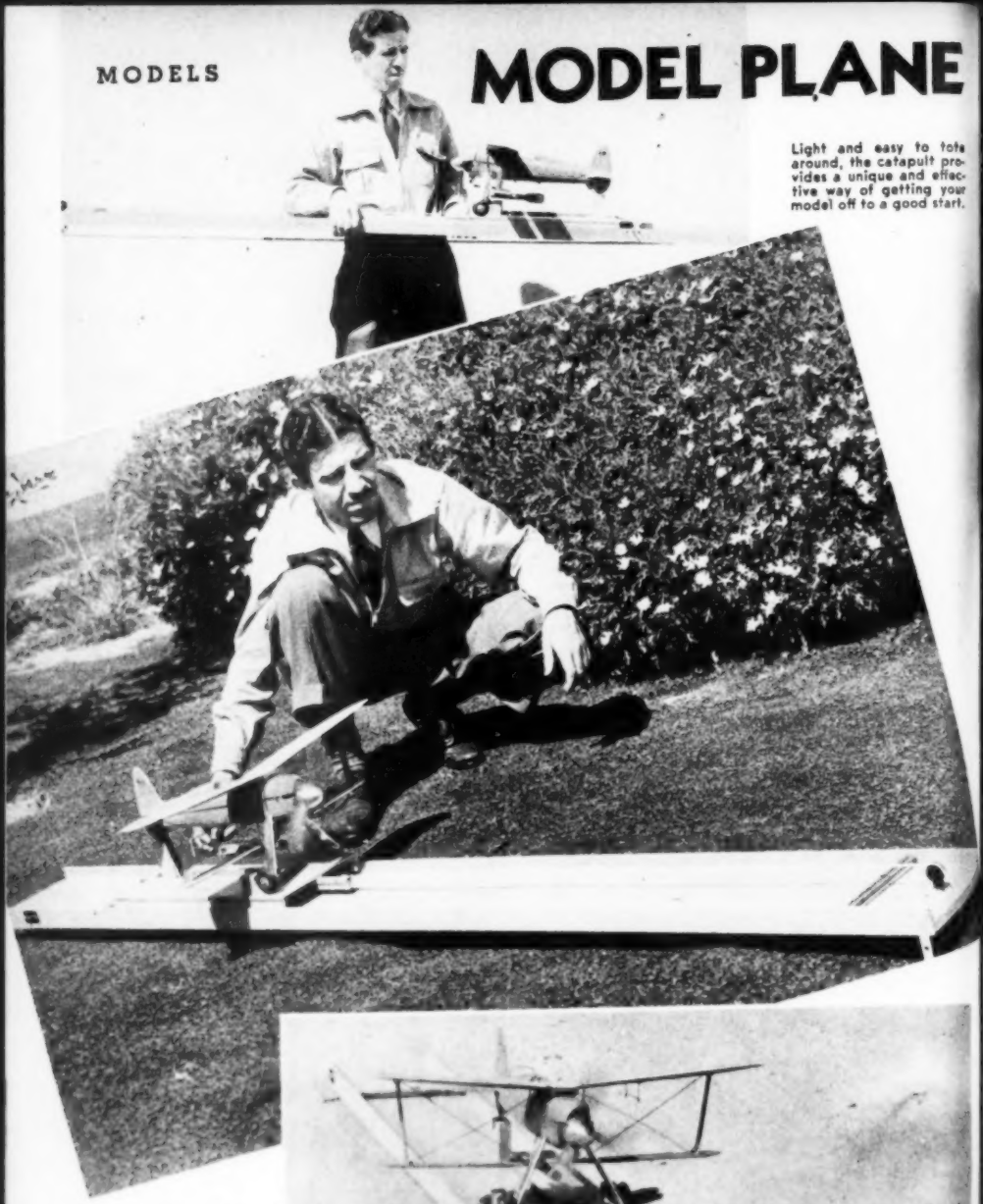


*Above:* Puppet levitation. Alexander the magician hypnotizes the Princess, who floats up from her couch in thin air. There are no strings on the Princess. As a matter of fact, this Lilliputpet production of the author's is an actual working model of the levitation performed by many magicians. In the final scene Alexander passes a hoop completely around the Princess. Average height of Lilliputpets is approximately three inches.



# MODEL PLANE

Light and easy to tote around, the catapult provides a unique and effective way of getting your model off to a good start.



*Above:* The model is adjusted on the moving platform, or car, which is whipped forward by a combination twine and rubber cord when release pin is pulled. *Right:* Snapped at a fast shutter speed, model and car are caught halfway along runway. Note rubber shock absorber stretched across catapult near end

# CATAPULT

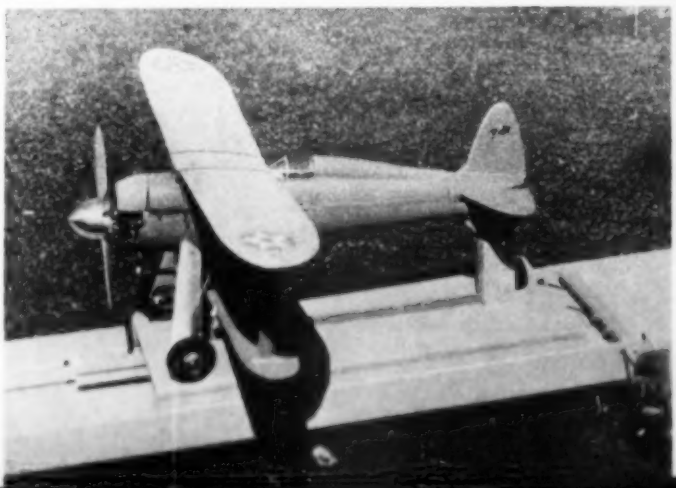
**Launch your gas models and gliders with this simple but ingenious equipment.**

by H. Seward Dion

Off she goes! The miniature war plane is hurled into the air at flying speed, its tiny engine roaring. These two shots were taken on different flights, one with the plane carrying a torpedo under fuselage, the other unloaded.

HAVE you ever watched one of our Navy airplanes leave a catapult from one of the big battleships? With the engine roaring, the pilot and gunner brace themselves for the sudden start, and are "shot" into the air. The thrill is great and the motor must be turning over perfectly to carry the airplane upward into the air. Having their special task to perform, they fly out to sea away from their mother ship. On returning they land near the battleship and are then hoisted aboard by means of an electric crane.

[*Continued on page* 143]



*Right:* Release trigger is held to dowel cross-brace by means of screw eyes. Wheel blocks are spaced according to undercarriage width of the model.

# HI-FI AUDIO AMPLIFIER

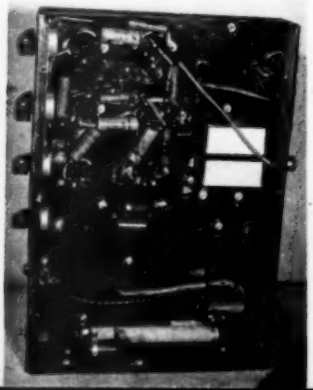
**Delivers 25 watts of high fidelity output for public address and other work where a combination of volume and clarity is required.**

by Ricardo Muniz
and
Joseph Trupiano

The amplifier in use for semi-professional recording.

*Above:* Used with FM receiver and bass reflex loud speaker.

*Below, left:* Top view. Note output transformer in corner diagonally opposite to power transformer. *Right:* Bottom view of chassis. Wires should be as short as possible to minimize hum.

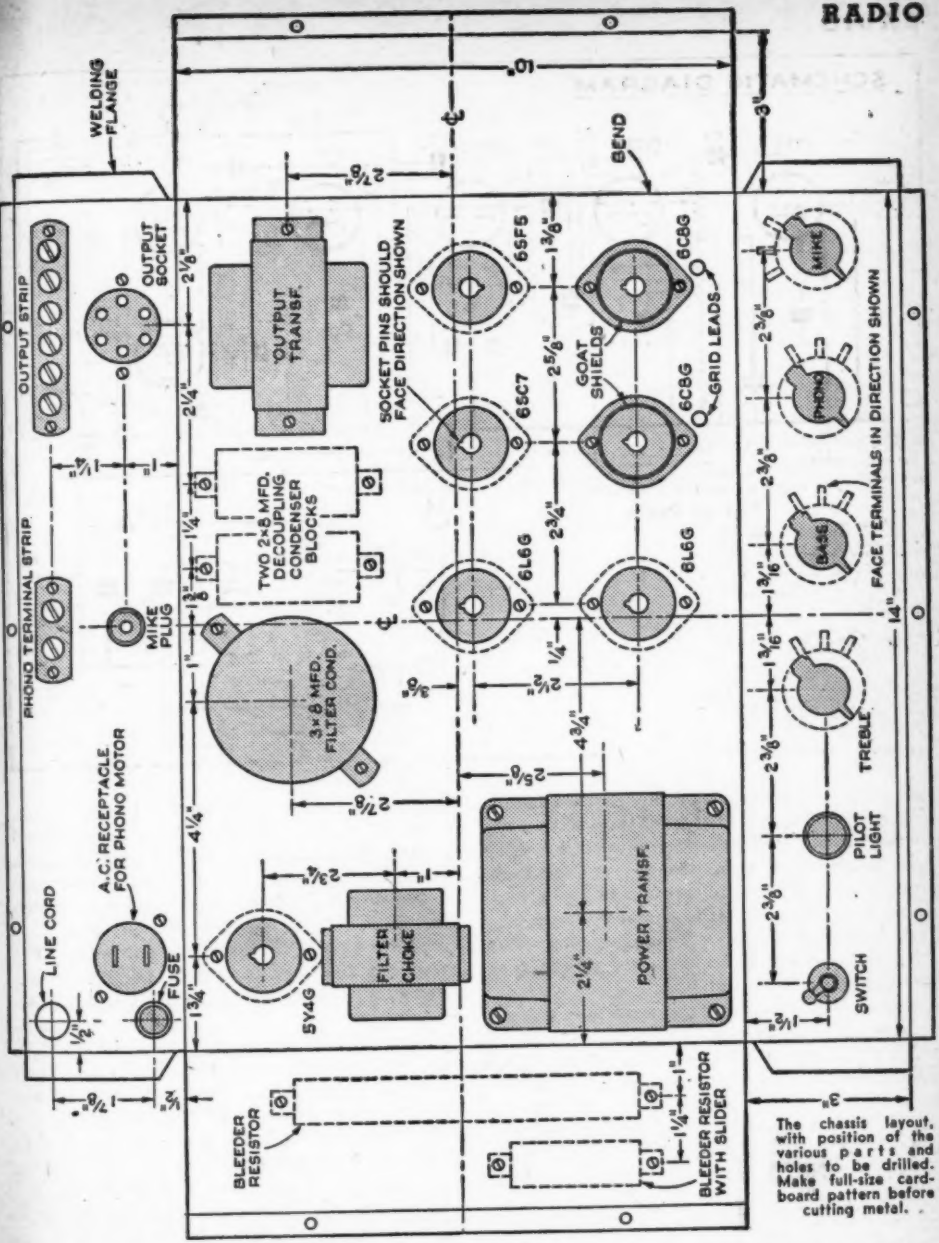


HERE is the audio amplifier you have been waiting for. Twenty-five watts of high fidelity audio you can use for public address work, for recording and for hi-fi home radio reproduction. The authors have built into this amplifier, at low cost, every desirable feature found in the commercial jobs: independent bass and treble electronic tone control, electronic mixing of phono and mike, high gain pre-amp for low output mikes, inverse-feedback, resistance coupling throughout, push-pull output class AB with phase inverter, minimum hum level, etc.

At a recent Columbus Day celebration the authors were called upon to supply P.A. We had, thus, the opportunity to let the amplifier out and see just how well it could perform.

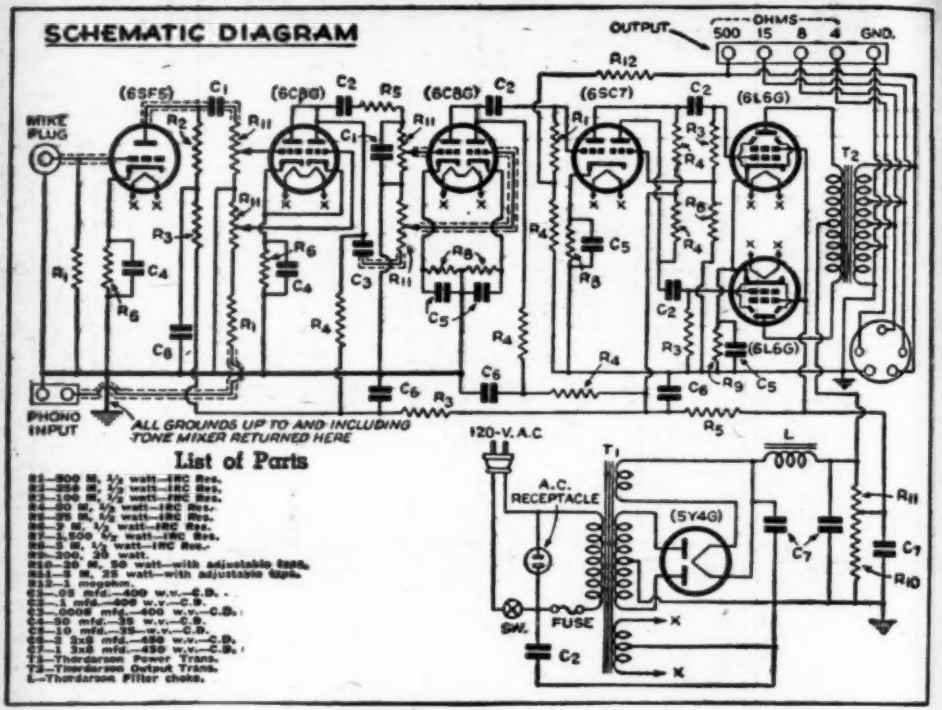
The job was an outdoor installation. A speakers' platform had been built on the high stoop of a private dwelling in the middle of a block about 200 feet wide and flanked on both sides by four story brownstone dwellings. It

*Below:* General view of the amplifier with its cover off. The microphone gives an idea of the unit's actual size.




The chassis layout, with position of the various parts and holes to be drilled. Make full-size cardboard pattern before cutting metal.

was desired that the speakers should be heard across the street, above the normal roar of traffic, and that enough sound be heard at the corners to attract attention. The 25W for 25D amplifier described herein did a very notable job. Many favorable comments were heard concerning the high fidelity and high volume. The loud speaker used was an A12PM in Bass Reflex enclosure. It was mounted in the attic window facing directly across the street. A record player was used and music was enjoyable at a distance of 500




feet and was clearly audible much further.

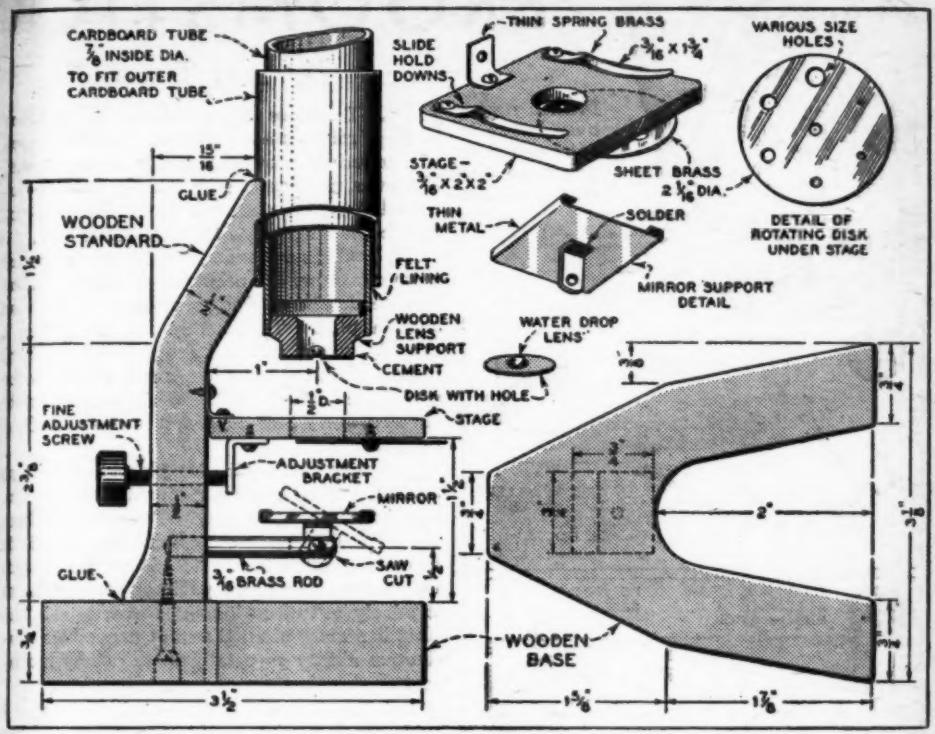
The amplifier has also been used with a recorder having an 8 ohm magnetic cutter. Very fine recordings were made of speakers, singers and orchestral groups using a high impedance Amperite PG dynamic mike.

At home the amplifier is used in connection with a Meissner FM tuner and yields very satisfactory results indeed.

*Tube Line-Up*: When the mike is in use the following tube line-up in operation: 6SF5 mike pre-amp, 6C8G electronic mixer, 6C8G electronic tone control, 6SC7 phase inverter, two 6L6G's push pull output. When the record player is used it is fed directly into the other half of the 6C8G mixer and the pre-amp is not in use. The power supply tube is a 5Y4.

*Pre-Amplifier*: A 6SF5 was chosen for this critical position because of its inherent low internal noise level combined with its relatively high gain. A triode was found most desirable here to minimize distortion for a pentode gives too much of this. A 500M resistor was used in the input to give best matching to high impedance mikes, best used to avoid the necessity of an input transformer. Good input transformers are expensive and tend to pick up excessive hum unless great precautions are taken. Crystal mikes such as the Shure 707 have been used with a high degree of fidelity as have the hi-impedance dynamic types previously mentioned. The shielding required in this stage will be described in a later paragraph but is not complicated.

*Electronic Mixer*: A dual triode, the 6C8G, was chosen for this stage because it gives you two practically independent triodes in one envelope each having the characteristics of a 6C5. Its characteristics are very linear over the required range and it provides the amount of gain required for the use of the record player. It is necessary to use either two separate tubes or a dual tube if we are to do away with all interaction between the phono and mike gain controls. This feature is highly desirable when fading from mike to phono or vice versa. The mixing is done at a relatively high level, after some amplification in the case of the mike, thus making the controls less likely to pick up [*Continued on page* 153]




Simple construction and dimensions of the microscope are given in the drawing above.

## Compound Microscope

[*Continued from page* 105]

This stage carries a number of attachments, not the least important of which is the fine adjustment for focusing. The stage itself moves, instead of the tube as in usual microscope construction. Attach the stage by one of its longer edges to the upright with an L-shaped piece of springy sheet brass or other metal of a width equal to that of the upright. The screws holding the metal to the upright should not be too near the stage. Leave ¼" or so space to permit the metal to bend fairly easily.

Mounted on the bottom of the stage is an L-shaped strip of stiff metal with the projecting part measuring ⅜"x½", and placed about ¼" from the upright. Drill a hole through the post at a point opposite this metal projection and force into it a stove bolt equipped with a convenient knurled knob. This screw is located so its other end will press against the metal projection beneath the stage. By forcing the screw outward, pressure is exerted against the metal strip, causing the stage to swing upward; and turning the screw back lets the stage swing downward.

Glass slides are held in position on the stage by two strips of spring metal measuring about 3/16" wide and 1¾" long. Small wood screws pass through holes in the ends of the strips and into the stage near the rear corners and as near the rear edge as possible.

The remaining stage gadget is a disk with a half-dozen holes of different size, mounted so one hole at a time can be turned into position beneath the ½" stage opening. This disk acts as a substage diaphragm for controlling the amount of light passing through the object. It frequently is possible to produce a much sharper image by turning into position a small diaphragm opening than would be possible without any light control device. The disk can be made of sheet copper or aluminum, and is about 1¾" in diameter, with the holes equally spaced at a distance of ½" from the center. The smallest hole is not much larger in diameter than an ordinary automatic pencil lead, and the largest one measures about ¼". The disk projects beyond the front edge of the stage where it can be rotated. Make a dot or line near the mid-point of the stage edge, and on the disk scribe other lines so you can tell when each hole is cen-

[*Continued on page* 158]

# BROOMSTICK

## by Ben Trask

**Making your own lures is easy and may produce surprising results.**

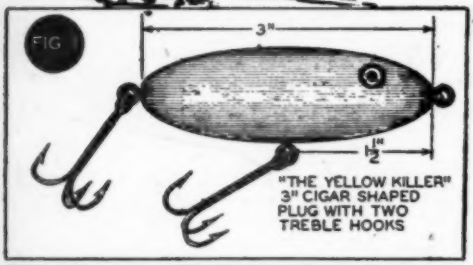
I MUST confess that no matter how a black bass might be caught, the method used will generally provide thrills hard to surpass. However, no greater satisfaction could be obtained than in the knowledge that success was due to the efficiency of a homemade lure.

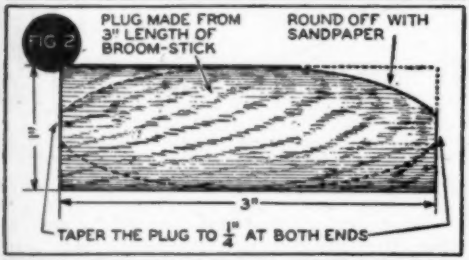
I'm quite sure that one of the proudest moments of my life occurred on the day when I succeeded in catching a two-pound bass on such a plug. To be sure the plug was a crudely made affair, having been whittled from a length of old stick, but it proved to be a real bass killer. Although it is now badly chewed, and water-logged, it is still one of my favorites.

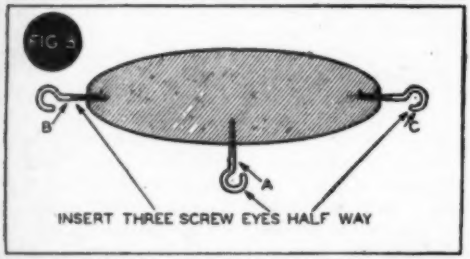
Just why this particular plug should be so consistently effective is a question that I cannot intelligently answer. Perhaps the bass are actually fooled into believing that it is something alive trying to get off the water. Or on the other hand, perhaps they strike at it purely out of curiosity. Nevertheless, the plug has more often than not proved its productive ability especially in the early morning, or shortly following sun-down.

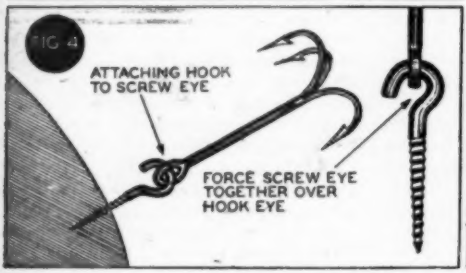
The "Yellow Killer," which is the name I have given the plug, is probably one of the easiest to make. And all that is necessary, for its construction, is a 3" piece of broom handle, a sharp knife, a wood rasp, and several grades of sandpaper. However, if you are one of the more fortunate home mechanics who own a wood turning lathe, you can turn out almost any of the popular plug models with surprising speed, and perfection, after a little practice.

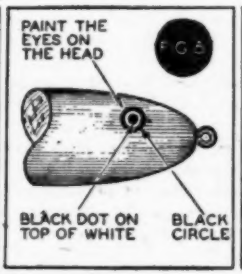
If you don't want to mess up your wife's new broom, by cutting off the handle, scout around the cellar where you'll probably locate an old cast off mop-handle which will suit the purpose just as well. However, if

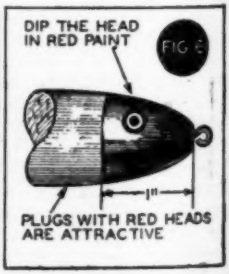


# BASS PLUGS

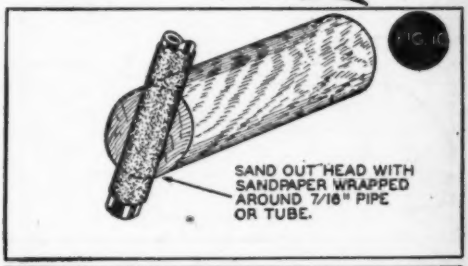
you don't happen to have the available material on hand, you can readily purchase new mop-handles, for a few cents, at any five and dime store.

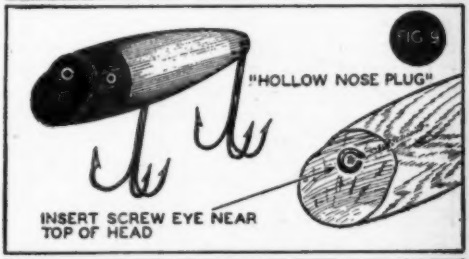
To properly construct the "Yellow Killer" first saw off a 3" length of broomstick and then taper it, cigar shaped, to ¼" at both ends, leaving the mid-section diameter of the plug approximately 1".

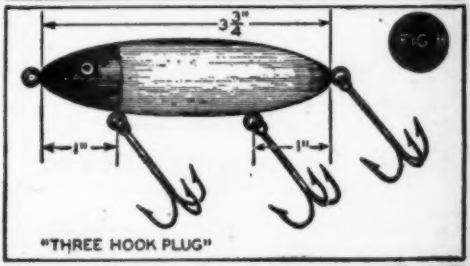
Carefully smooth out any roughness on the plug body, with fine sandpaper. Then insert a ¾" screw eye, with an eye not larger than ¼", half way into the end of the plug at point "A" (Fig. 3), or the end chosen for the head of the plug. (Both ends tapering to the same diameter, the head choice is optional). And then after slightly forcing open, with a pair of thin nosed pliers, the eyes of two additional screws which will later be joined to the necessary treble hooks, insert one screw in the end of the plug at point "B," half way. The other insert half way in the plug at point "C," or 1½" from either end. I have directed that the screw eyes be inserted half way only, because this will simplify matters in the final painting.

Clean the plug with turpentine, and then, holding one of the end screw eyes with a pair of pliers, apply a coat of shellac, brushing it thoroughly into the pores of the wood. When the plug has dried completely, rub it down with fine steel wool. Clean it again with turpentine and apply a second coat of shellac. When this has dried, paint the plug with a thick coat of yellow, slow drying, flat paint after which hang the plug up to dry for at least twenty-four hours. When the yellow paint has dried sufficiently, rub the plug down with fine steel wool.

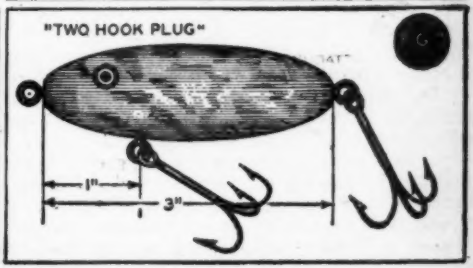
Attach a size No. 1 treble hook to the screw eyes at points "B" and "C" and press the partly opened eyes back into place with a pair of pliers [*Continued on page* 160]



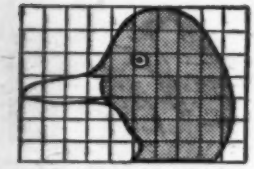



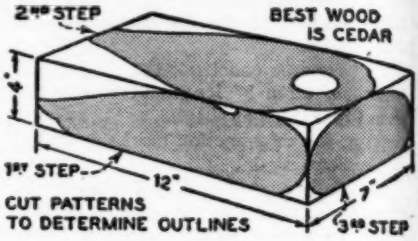



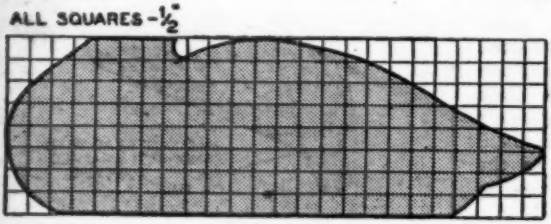
THE "YELLOW KILLER" IS PROBABLY ONE OF THE EASIEST TO MAKE. ALL THAT IS NECESSARY, FOR ITS CONSTRUCTION, IS A 3" BROOM-STICK, A KNIFE, WOOD RASP & SANDPAPER.



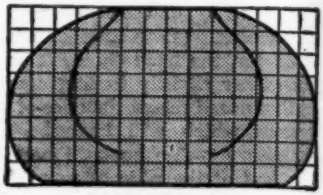
Drawing shows simple details of typical decoy. This particular decoy is shaped like a Black Duck, Mallard, Canvasback or Redhead, and will attract and deceive all these species if painted to look like any one of them. For best results paint should be applied directly to the bare wood without any undercoat. A screweye is fastened to the bottom for anchoring.



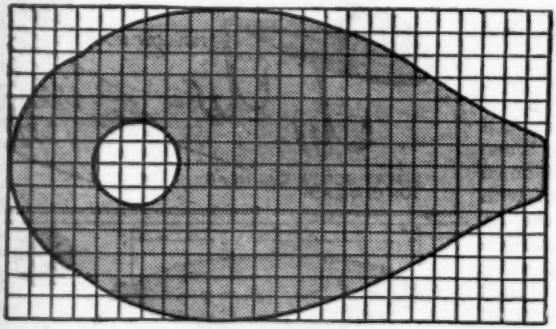


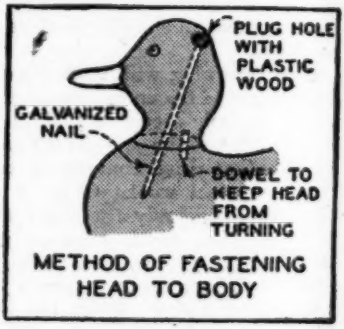

SIDE VIEW



FRONT VIEW



PLAN VIEW




METHOD OF FASTENING HEAD TO BODY

## Fifth Column For Ducks

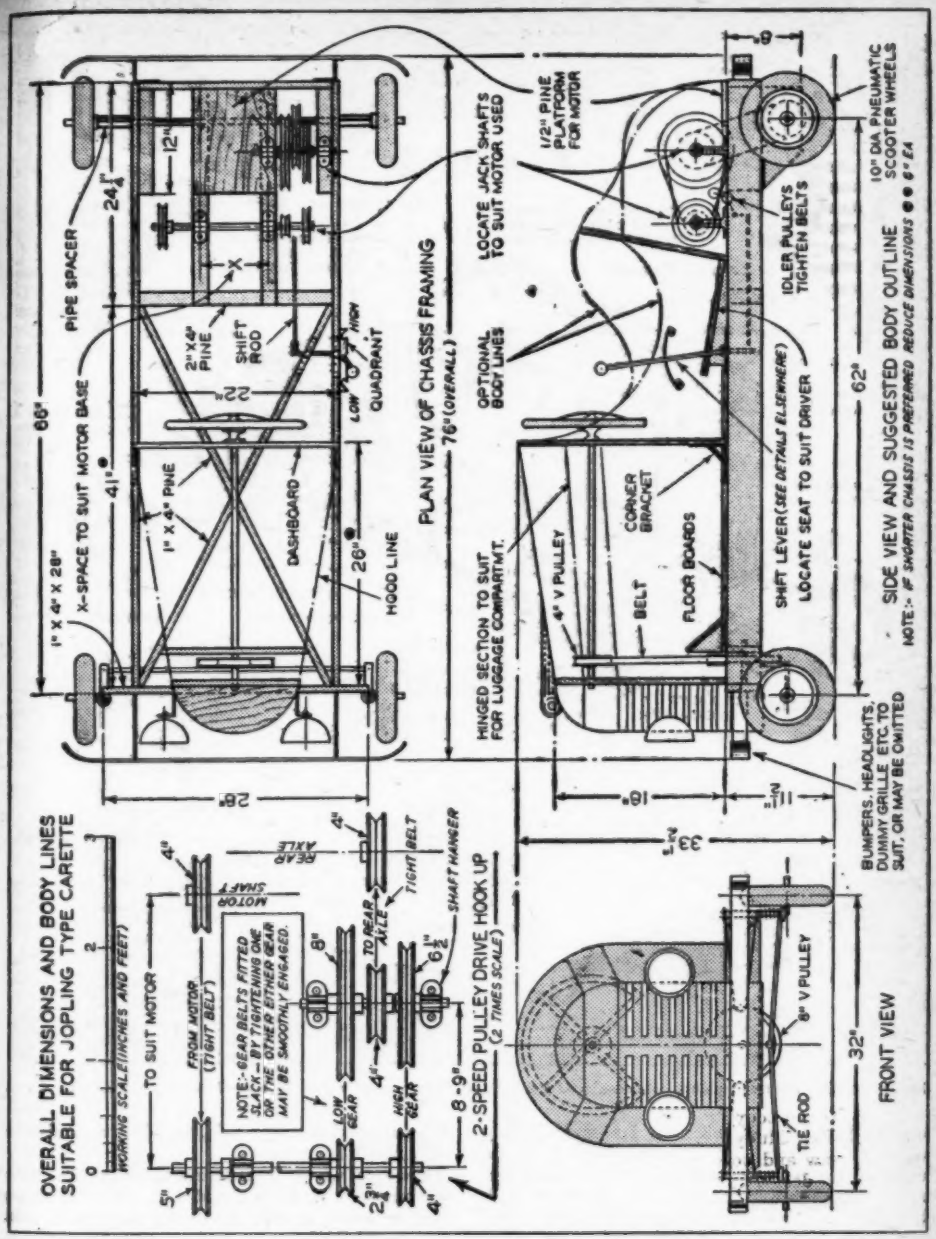
[*Continued from page* 107]

the plan view pattern. It is a simple procedure to cut the rough body shape from the block, using the band saw. Study the photo of Steve Ward at the band saw and note the notch cut out of the front of the decoy. This notch is not absolutely necessary but it makes a better base for the head to be joined on after the body has been shaped to complete conformity. The head and neck itself should be rough cut from a block 2" thick and as square as is necessary for a pattern of a duck head to be laid out on. No two kinds of ducks have heads or bodies exactly alike and it is always a good idea to study books or pictures of ducks—better still, hie yourself away to the marshes and study the real thing, on the water and on wing.

After the body is pattern-cut on the band saw the hatchet comes into use. This is a job which requires care. A careless slash of the hatchet and the decoy is ruined in its early stage. When the hatchet can no longer be used without danger of cutting too much away place the body in a vise and using the spoke shave smooth down as much as possible. When you feel that the spoke shave has played its part to the limit there comes a job which takes time but should not be done carelessly. Sandpapering! Your decoy must be as smooth as silk before painting and be sure that it is.

Now, using a pattern similar to that shown, cut out the rough shape of the head. The penknife

[*Continued on page* 162]


PLAN VIEW OF CHASSIS FRAMING
SIDE VIEW AND SUGGESTED BODY OUTLINE
FRONT VIEW
OVERALL DIMENSIONS AND BODY LINES SUITABLE FOR JOPLING TYPE CARETTE
2-SPEED PULLEY DRIVE HOOK UP (2 TIMES SCALE)
1" X 4" X 28"
X-SPACE TO SUIT MOTOR BASE
PIPE SPACER
2" X 4" PINE
SHIFT ROD
QUADRANT
DASHBOARD
HOOD LINE
LOCATE JACK SHAFTS TO SUIT MOTOR USED
OPTIONAL BODY LINES
1/2" PINE PLATFORM FOR MOTOR
IDLER PULLEYS TIGHTEN BELTS
10" DIA PNEUMATIC SCOOTER WHEELS
HINGED SECTION TO SUIT FOR LUGGAGE COMPARTMT.
4" V PULLEY
CORNER BRACKET
BELT
FLOOR BOARDS
SHIFT LEVER (SEE DETAILS ELSEWHERE)
LOCATE SEAT TO SUIT DRIVER
BUMPERS, HEADLIGHTS, DUMMY GRILLE ETC. TO SUIT, OR MAY BE OMITTED
NOTE:- IF SHORTER CHASSIS IS PREFERRED REDUCE DIMENSIONS
TO SUIT MOTOR
FROM MOTOR (TIGHT BELT)
MOTOR SHAFT
REAR AXLE
TO REAR AXLE
TIGHT BELT
SHAFT HANGER
LOW GEAR
HIGH GEAR
NOTE:-GEAR BELTS FITTED SLACK— BY TIGHTENING ONE OR THE OTHER EITHER GEAR MAY BE SMOOTHLY ENGAGED.
8" V PULLEY
TIE ROD

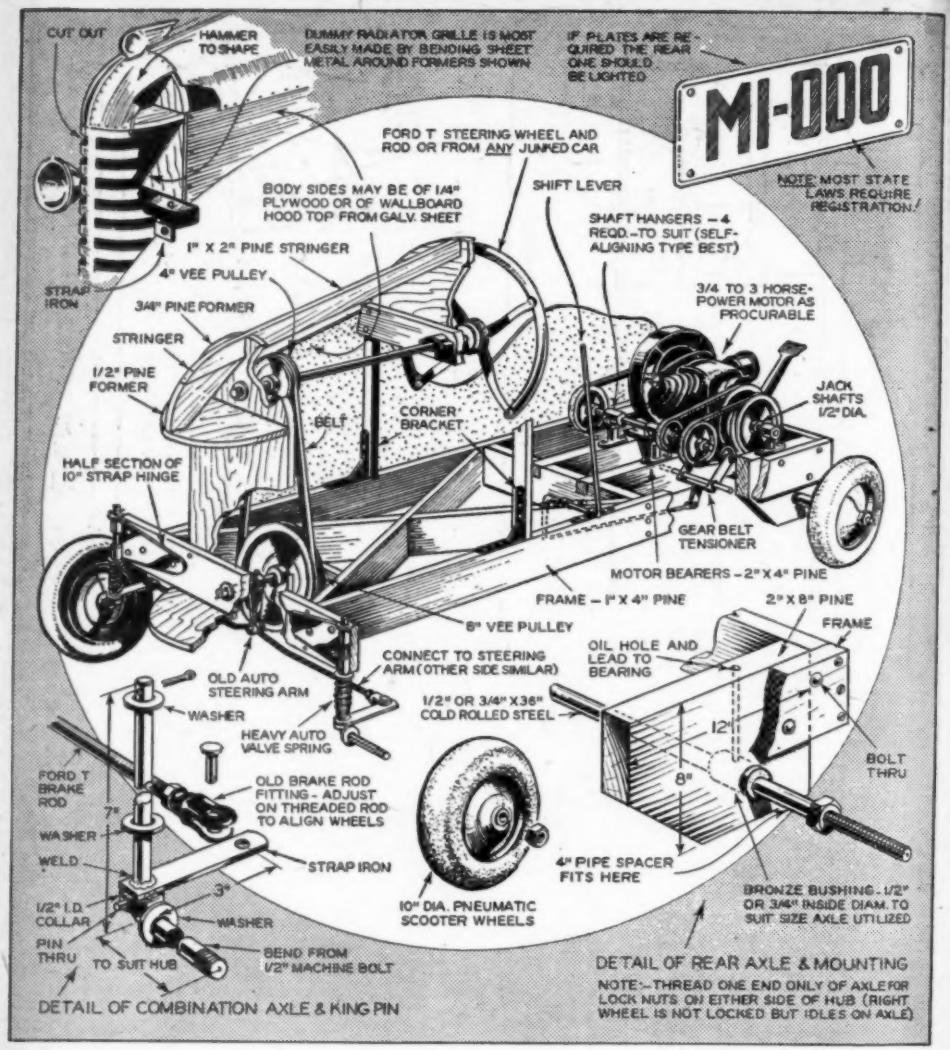
Structural details and dimensions of *Leon*. Where dimensions are not given, they must be suited to the individual motor used.

## Leon And Ickle

[*Continued from page* 103]

chain to be just below the body level. The one-gallon gasoline tank sits in front of the engine, with the fuel strainer directly beneath it. The carburetor is on the back side of the engine, a wire encased in a flexible sleeve running from it back to the seat to serve as the accelerator.

On the engine drive shaft, Smith mounted a


CUT OUT
HAMMER TO SHAPE
DUMMY RADIATOR GRILLE IS MOST EASILY MADE BY BENDING SHEET METAL AROUND FORMERS SHOWN
IF PLATES ARE REQUIRED THE REAR ONE SHOULD BE LIGHTED
MI-000
NOTE: MOST STATE LAWS REQUIRE REGISTRATION.
FORD T STEERING WHEEL AND ROD OR FROM ANY JUNKED CAR
SHIFT LEVER
BODY SIDES MAY BE OF 1/4" PLYWOOD OR OF WALLBOARD HOOD TOP FROM GALV. SHEET
SHAFT HANGERS – 4 REQD. – TO SUIT (SELF-ALIGNING TYPE BEST)
1" X 2" PINE STRINGER
4" VEE PULLEY
STRAP IRON
3/4" PINE FORMER
STRINGER
1/2" PINE FORMER
3/4 TO 3 HORSE-POWER MOTOR AS PROCURABLE
JACK SHAFTS 1/2" DIA.
BELT
CORNER BRACKET
HALF SECTION OF 10" STRAP HINGE
GEAR BELT TENSIONER
MOTOR BEARERS – 2" X 4" PINE
FRAME – 1" X 4" PINE
2" X 8" PINE FRAME
6" VEE PULLEY
OIL HOLE AND LEAD TO BEARING
CONNECT TO STEERING ARM (OTHER SIDE SIMILAR)
OLD AUTO STEERING ARM
WASHER
HEAVY AUTO VALVE SPRING
1/2" OR 3/4" X 36" COLD ROLLED STEEL
12"
8"
BOLT THRU
FORD T BRAKE ROD
OLD BRAKE ROD FITTING - ADJUST ON THREADED ROD TO ALIGN WHEELS
7"
WASHER
WELD
STRAP IRON
3"
1/2" I.D. COLLAR
WASHER
PIN THRU
TO SUIT HUB
BEND FROM 1/2" MACHINE BOLT
4" PIPE SPACER FITS HERE
10" DIA. PNEUMATIC SCOOTER WHEELS
BRONZE BUSHING - 1/2" OR 3/4" INSIDE DIAM. TO SUIT SIZE AXLE UTILIZED
DETAIL OF COMBINATION AXLE & KING PIN
DETAIL OF REAR AXLE & MOUNTING
NOTE:- THREAD ONE END ONLY OF AXLE FOR LOCK NUTS ON EITHER SIDE OF HUB (RIGHT WHEEL IS NOT LOCKED BUT IDLES ON AXLE)

**General assembly and steering detail of *Leon*. Hood and body structure may be varied or omitted, or side by side seat added.**

bicycle sprocket cog, with the larger pedal cog wheel mounted on a jack-shaft located in the center of the body. A conventional bicycle chain transmits the power from the engine to the jack shaft which is mounted on the under side of the side body irons in countershaft hangars with bronze bushings, and lubrication nozzles. The purpose of this jack shaft is both to gear up the speed of the engine, and to effect a two-wheel drive at the rear wheels. The jack shaft ends protrude at each side of the body, with 4" pulleys mounted on the ends. From these, V-belts run to 6" pulleys on the rear axle, which is a dead axle with roller bearings.

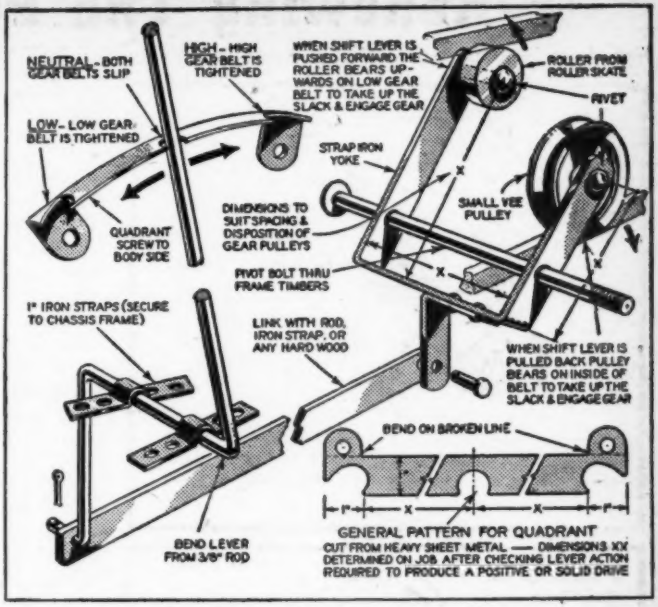
The rear wheels are spring mounted; the axle is connected to the body at each wheel through a dual spring mounting, the springs being odd springs selected on the basis of size. The axle is anchored to the body through two strut or tie rods running to the center of the body to brackets, adjustable through the nuts on the threaded end at the bracket.

The brake is an ingenious device consisting of a full drum, 5" in diameter, which was originally

a flat pulley on a saw rig, and a half-band, lined with asbestos, which operates as a drag at the back side. The brake rod runs directly to the bottom of the band from the brake pedal, so that depressing the pedal brings it directly against the drum. A repeller-spring on the rod keeps it disengaged when not in use.

The clutch is actuated by pulling on the pedal, which releases the connector spring on the jack shaft, allowing the sprocket to engage the jack shaft.

Smith's steering gear is ultra-simple, being based on a single front wheel, mounted in an old king pin ball bearing set. In lieu of a wheel, he has a curved section of pipe running up and back from the king-pin mounting, steering the Lolley like a rudder.


NEUTRAL - BOTH GEAR BELTS SLIP
HIGH - HIGH GEAR BELT IS TIGHTENED
WHEN SHIFT LEVER IS PUSHED FORWARD THE ROLLER BEARS UPWARDS ON LOW GEAR BELT TO TAKE UP THE SLACK & ENGAGE GEAR
ROLLER FROM ROLLER SKATE
RIVET
LOW - LOW GEAR BELT IS TIGHTENED
STRAP IRON YOKE
SMALL VEE PULLEY
QUADRANT SCREW TO BODY SIDE
DIMENSIONS TO SUIT SPACING & DISPOSITION OF GEAR PULLEYS
PIVOT BOLT THRU FRAME TIMBERS
1" IRON STRAPS (SECURE TO CHASSIS FRAME)
LINK WITH ROD, IRON STRAP, OR ANY HARD WOOD
WHEN SHIFT LEVER IS PULLED BACK PULLEY BEARS ON INSIDE OF BELT TO TAKE UP THE SLACK & ENGAGE GEAR
BEND ON BROKEN LINE
GENERAL PATTERN FOR QUADRANT
CUT FROM HEAVY SHEET METAL — DIMENSIONS XX DETERMINED ON JOB AFTER CHECKING LEVER ACTION REQUIRED TO PRODUCE A POSITIVE OR SOLID DRIVE
BEND LEVER FROM 3/8" ROD

Roller skate wheel and small V-pulley provide 2-speed clutch action on *Leon*, also neutral.

The car has no starter; it is started by winding a length of rope around the fly-wheel at the other end of the shaft and pulling, like on an outboard motor.

For a seat, Smith simply welded a four-legged stool, placed a wooden top and cushion on top, and welded the leg-ends to the back of the body. The wheels are pneumatic, being taken from a pair of discarded motor scooters.

So much for the "de luxe" model. The "standard" model, *Leon*, fashioned by Jopling, is essentially simpler in make-up, though, in avoiding the complications of a drive shaft and steering system, Jopling did develop an amazing array of V-belts.

Jopling's car's body is all wood, being built of scrap lumber, with an oblong body constructed along the same lines as Smith's. Jopling put his engine, taken from a gasoline-powered washing machine, at the rear. It is ¾ h.p., which runs at about 500 r.p.m. The gasoline tank, holding one quart, is built into the motor base. Jopling's car has a top speed of 15 m.p.h., and gets about 100 miles per gallon.

The most interesting feature of Jopling's project is his ingenious use of V-belts in developing a full-fledged two-speed "gear" system. The power takes off the engine drive shaft from a 4" pulley, and is connected through a V-belt to a 5" pulley at the end of a jack-shaft mounted on hangars directly in front of the engine and behind the driver's seat. At the other end of the jack shaft are two pulleys, connected to other pulleys on another, shorter jack shaft just behind the first. A V-belt runs from a 2¾" pulley on the front shaft to an 8" pulley on the rear, short shaft, and another V-belt connects a 4" pulley on the front shaft to a 6½" pulley on the rear shaft. Between these two pulleys on the rear shaft is a 4" pulley, which connects by V-belt with another 4" pulley on the wheel axle itself. The "gear shift," a metal rod running from the driver's seat back to a bracket, controls two idlers made from a roller skate wheel and a small V-belt pulley which enables the driver to take up the slack in the high-speed or low gear pulley sets, making the idle belt slip while the "gear" is operative. The idler bracket or yoke is pivoted from a rod that runs between the chassis from the inside motor support to the outside of the chassis.

The rear axle, *driven from the left side only*, is a live axle turning in bearings which consist of snug, lubricated bronze bushings in a heavy wood block on the rear of the chassis on each side.

The front axles are made from ½" machine bolts with heads cut off, and bent to a 90 degree angle. The tie rod runs across from an arm which is made of a short length of ½" shaft, a ½" collar welded to the tie rod. The front axles are separate, each being connected to the front end of the chassis by one-half of a strap hinge, the vertical portion of the axle running through the hinge-bolt apertures. Another ½" collar is placed on the vertical axle below the hinge, making space for a coil spring. No springing was possible on the rear wheels, due to the solid mounting of the axle.

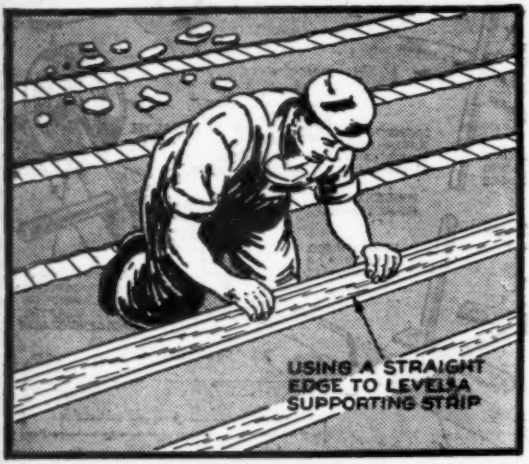
From the axle, the tie-rod runs back and up to a large pulley, operating vertically across the

[*Continued on page* 156]

# Renewing The Porch Roof

**Stop those leaks with this effective home repair job.**

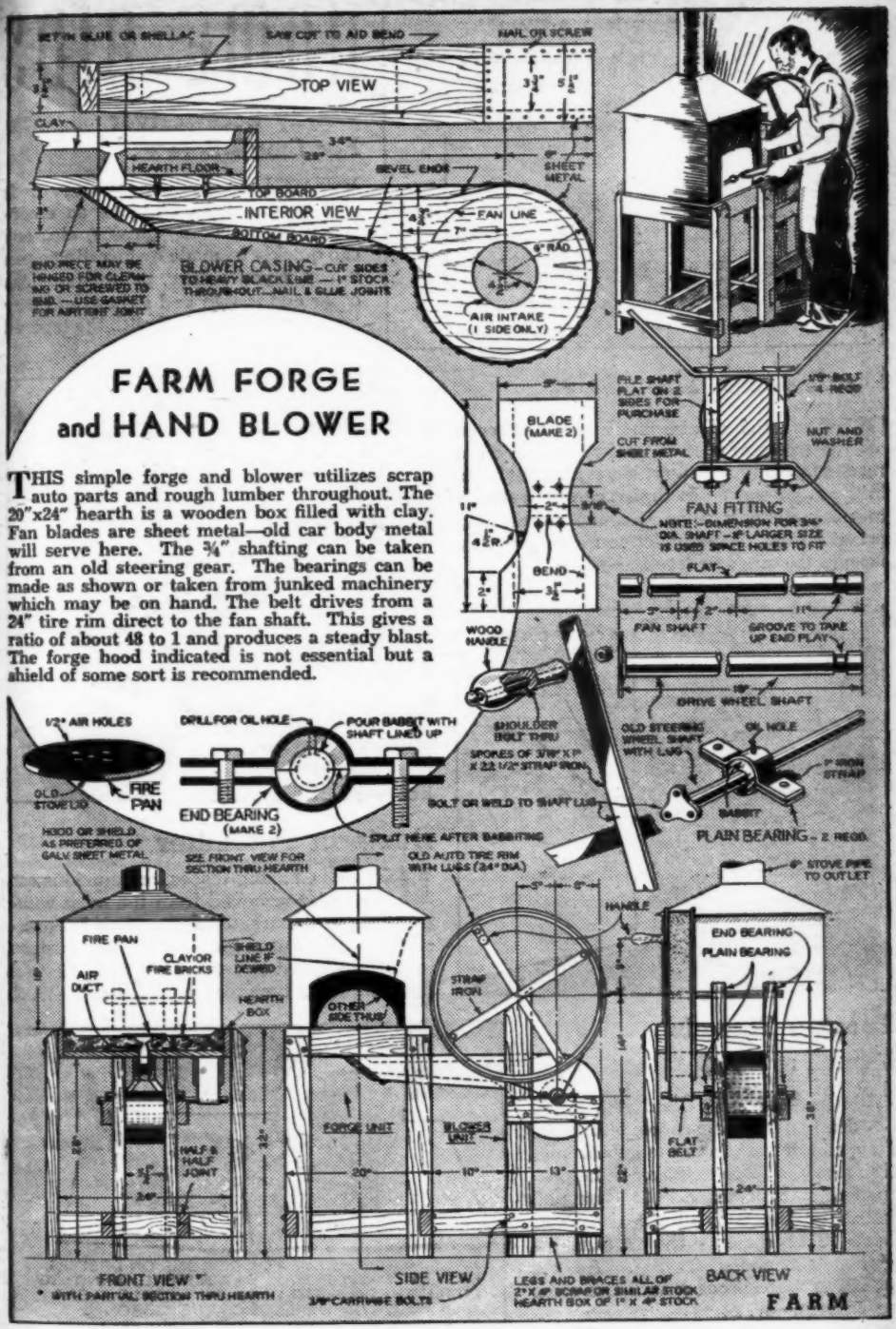
by Walter E. Burton



A COMMON roofing problem is this: A slightly-sloping roof that is used as an airing porch or sun deck develops the habit of leaking, or otherwise becomes unsatisfactory. Diagnosis reveals that the trouble is caused by buckling and cracking of the composition roll roofing used on the deck, probably from a combination of ailments including too little slope, insecure foundation and rough usage.

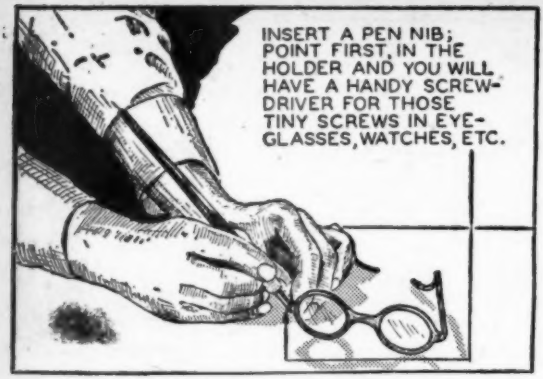
The drawings illustrate the way in which one such case was treated. In this particular instance, the trouble seemed to be caused by warped and springy sheathing boards, which moved up and down whenever anyone walked on them. The slate-surfaced roll roofing also had buckled badly, and was cracked.

It was decided to lay a new base of 6-in. matched sheathing (tongue-and-grooved), and over this place asphalt roll roofing. To support the sheathing and make it possible to even the roof surface, parallel strips were run, on 16-in. centers, from the house wall to the outer edge. Wherever a strip was laid, the old composition roofing was chopped away with a hatchet. Otherwise it would have been almost [*Continued on page* 164]


SET IN GLUE OR SHELLAC
SAW CUT TO AID BEND
NAIL OR SCREW
TOP VIEW
CLAY
HEARTH FLOOR
BEVEL ENDS
SHEET METAL
TOP BOARD
INTERIOR VIEW
FAN LINE
BOTTOM BOARD
END PIECE MAY BE HINGED FOR CLEANING OR SCREWED TO BIN — USE GASKET FOR AIRTIGHT JOINT
BLOWER CASING—CUT SIDES TO HEAVY BLACK LINE — 1" STOCK THROUGHOUT—NAIL & GLUE JOINTS
AIR INTAKE (1 SIDE ONLY)
FARM FORGE and HAND BLOWER
BLADE (MAKE 2)
FILE SHAFT FLAT ON 2 SIDES FOR PULLEY
CUT FROM SHEET METAL
NUT AND WASHER
FAN FITTING
NOTE:—DIMENSION FOR 3/4" DIA. SHAFT—1" LARGER SIZE IS USED. SPACE HOLES TO FIT
BEND
FLAT
FAN SHAFT
GROOVE TO TAKE UP END PLAY
DRIVE WHEEL SHAFT
WOOD HANDLE
SHOULDER BOLT THRU
SPOKES OF 3/16" X 1" X 2 1/2" STRAP IRON
OLD STEERING WHEEL SHAFT WITH LUG
OIL HOLE
1" IRON STRAP
BABBIT
PLAIN BEARING - 2 REQD.
BOLT OR WELD TO SHAFT LUG
1/2" AIR HOLES
DRILL FOR OIL HOLE
POUR BABBIT WITH SHAFT LINED UP
OLD STOVE LID
FIRE PAN
END BEARING (MAKE 2)
SPLIT HERE AFTER BABBITING
HOOD OR SHIELD AS PREFERRED OF GALV. SHEET METAL
SEE FRONT VIEW FOR SECTION THRU HEARTH
OLD AUTO TIRE RIM WITH LUGS (24" DIA.)
HANDLE
6" STOVE PIPE TO OUTLET
FIRE PAN
AIR DUCT
CLAYIOR FIRE BRICKS
SHIELD LINE IF DESIRED
HEARTH BOX
OTHER SIDE THUS
STRAP IRON
END BEARING
PLAIN BEARING
FORGE UNIT
BLOWER UNIT
HALF & HALF JOINT
FLAT BELT
FRONT VIEW *
* WITH PARTIAL SECTION THRU HEARTH
SIDE VIEW
3/8" CARRIAGE BOLTS
LEGS AND BRACES ALL OF 2" X 4" SCRAP OR SIMILAR STOCK. HEARTH BOX OF 1" X 4" STOCK
BACK VIEW
FARM

THIS simple forge and blower utilizes scrap auto parts and rough lumber throughout. The 20"x24" hearth is a wooden box filled with clay. Fan blades are sheet metal—old car body metal will serve here. The ¾" shafting can be taken from an old steering gear. The bearings can be made as shown or taken from junked machinery which may be on hand. The belt drives from a 24" tire rim direct to the fan shaft. This gives a ratio of about 48 to 1 and produces a steady blast. The forge hood indicated is not essential but a shield of some sort is recommended.

# HOME AIDS

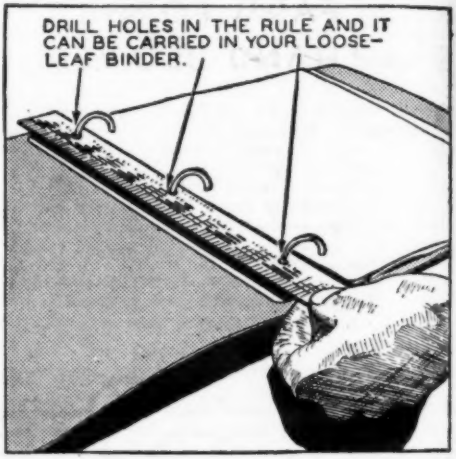

INSERT A PEN NIB; POINT FIRST, IN THE HOLDER AND YOU WILL HAVE A HANDY SCREW-DRIVER FOR THOSE TINY SCREWS IN EYE-GLASSES, WATCHES, ETC.

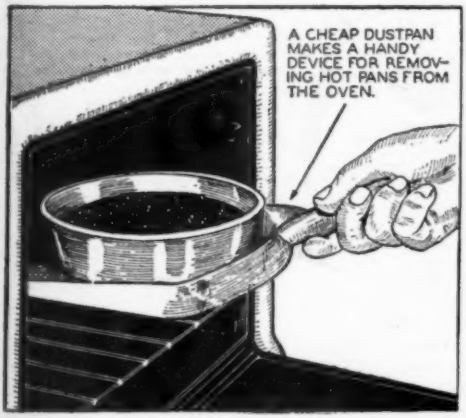
## Handy Screwdriver For Small Screws

WHEN a small screwdriver is needed for such jobs as emergency repairs on eyeglasses, etc., one can quickly be made by inserting a pen nib in a pen holder, point first. The other end is thin and strong, and may be easily manipulated with the tapered pen holder.—*W. S.*

## Don't Lose The Ruler

THE practice of carrying a ruler between the pages of a loose leaf notebook often results in the loss of the ruler. By boring holes in the ruler spaced so that it can be fastened to the notebook rings like the pages, will prevent loss. When ruler is needed, simply unsnap the rings to free it.—*W. S.*




## Dustpan Pot Lifter

HOT pans, baking dishes, or ramekins can be easily removed from the oven without danger of burned fingers, if an inexpensive dustpan is used for the job. The dustpan is simply slipped under the hot pan. Several hot dishes at a time may be lifted out.—*W. S.*

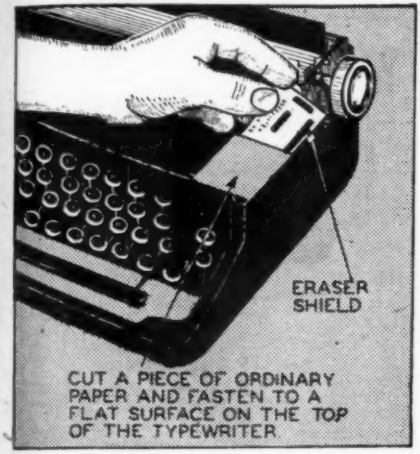
## Keeping Threads From Fraying

THE ends of bows and ribbons on dresses, hats and shoes, sometimes fray, and detract from the appearance. The array of loose threads can be prevented by brushing a little clear nail polish on the ends of the ribbon or bow. This cements the threads together and stops fraying. As the polish is waterproof it will not come off in rain.—*W. S.*

TO PREVENT THE ENDS OF RIBBONS ON DRESSES, HATS, ETC, FROM PRODUCING A HUNDRED ANNOYING LITTLE THREADS, SIMPLY BRUSH A LITTLE CLEAR NAIL POLISH ON THE ENDS OF THE RIBBON

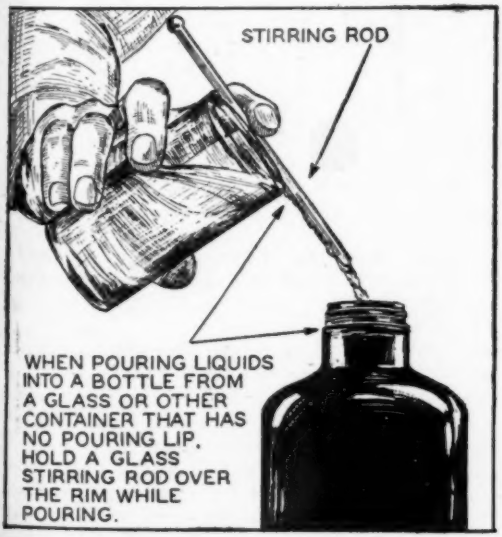
## India Ink Stopper Makes Good Insulator

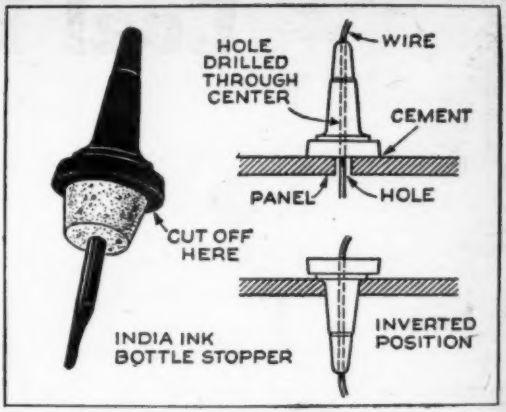
THE stoppers from empty India ink bottles make good insulators. Cut the cork end off just below the flange on the stopper, and drill a hole clear through the upper part. Use stopper-insulator as shown, cementing to the panel.




## For Spill-Proof Pouring

A GLASS stirring rod, held as shown will prevent spilling when pouring fluids from a tumbler to a bottle.—*W. S.*


STIRRING ROD
WHEN POURING LIQUIDS INTO A BOTTLE FROM A GLASS OR OTHER CONTAINER THAT HAS NO POURING LIP, HOLD A GLASS STIRRING ROD OVER THE RIM WHILE POURING.

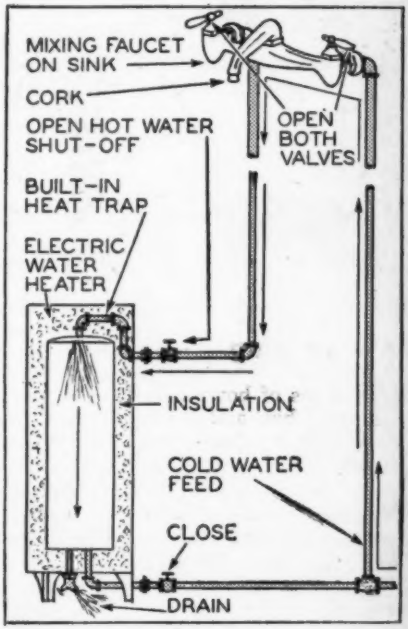



## To Help The Typist

THE typewriter eraser shield is one of the accessories frequently mislaid. Keep it handy by making a paper pocket for it on one of the flat upper surfaces of the typewriter.—*R. H.*

## Water Heater Flushing

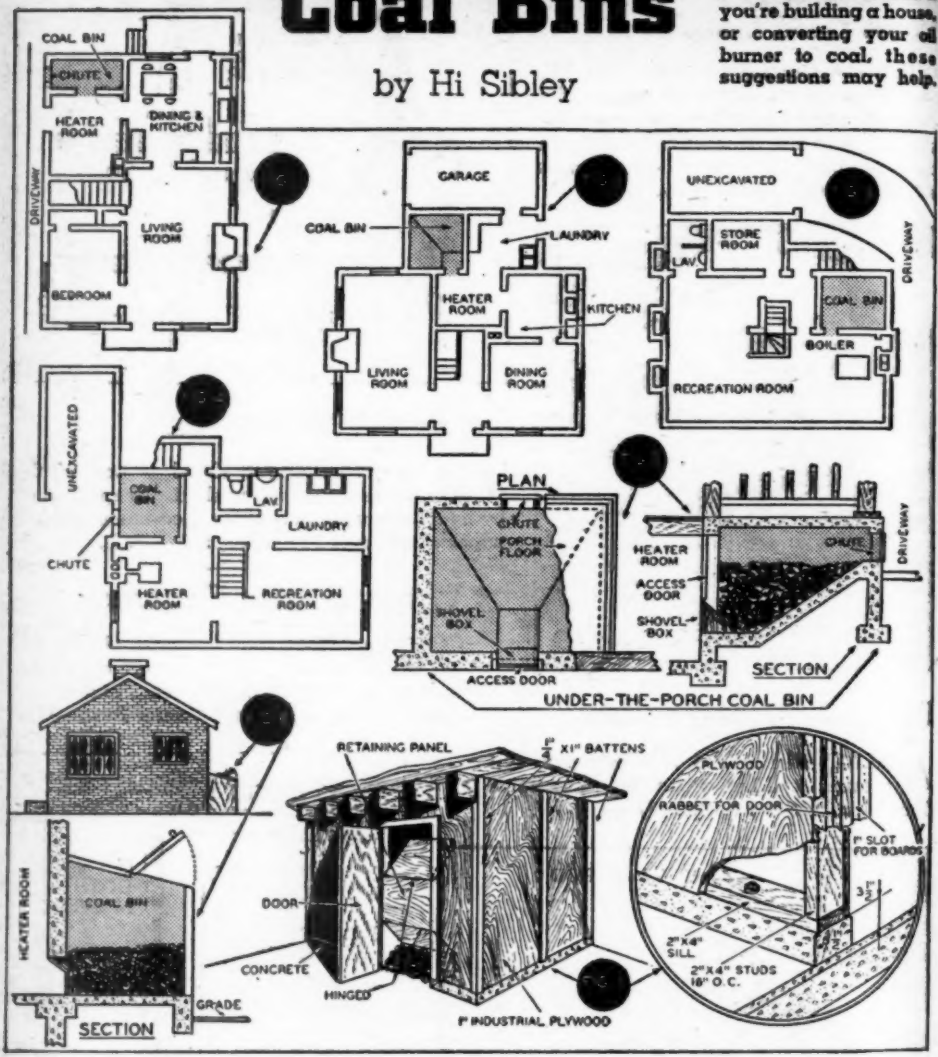
THE household water heater can be flushed out by corking the "mixing," or single-outlet faucet in the kitchen sink, and setting heater valves as shown for water flow.—*J. M.*



# Coal Bins

by Hi Sibley

**This winter the accent is on anthracite, and if you're building a house, or converting your oil burner to coal, these suggestions may help.**




THE important business of heating a house is simplified by advantageous location and efficient design of the coal bin, and here are a few suggestions. Location of the bin is often a problem in some of the compact new no-basement houses and in Fig. 1 is shown a typical plan, without attached garage, or a two-story town or farm house in which bin and heater room are located in the rear corner accessible from the driveway.

The next plan (Fig. 2) illustrates arrangement of a no-basement two-story house with attached garage. In this the heater room is centrally located and coal storage requires only one short outside wall and building of the bin itself.

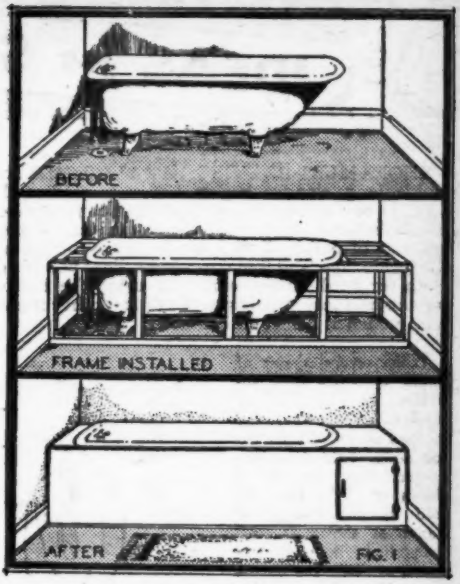
And attached-garage house plan with basement is shown in Fig. 3 which includes lavatory, store room and recreation room as well as coal bin. This is adapted to a plywood bin with coal chute at grade level on the driveway. Note that driveway, coal bin and heater are grouped for minimum distances between.

[*Continued on page* 166]

# MODERNIZE YOUR BATHTUB

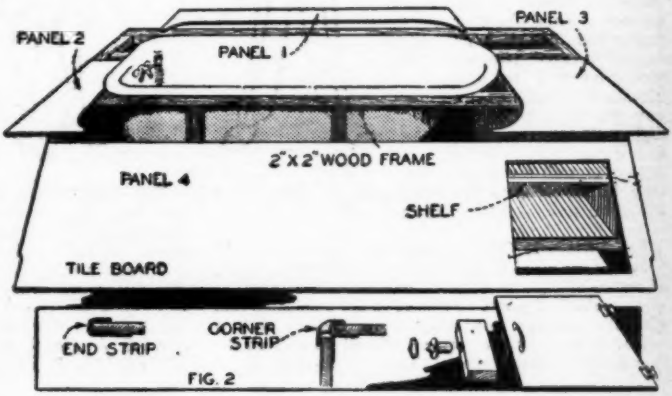
by Harold Jackson

MANY homes have the old style bath tub and many home owners would like to have the new corner or wall-to-wall tubs but do not feel able to make the change just now. We have one of these old type tubs in our house. It was very hard to clean under and back of and it casts a dark shadow and the floor and wall around it. I decided to try to bring it up to date. I built a wall-to-wall case around it using white tile board for the panels. The results are entirely satisfactory and the complete cost was less than $15.00. The appearance of our bath room has been greatly improved. It looks modern, the room is much lighter, it is far easier to clean and the unsightly pipes, etc., are covered. This is a low cost improvement that is really worthwhile and does not require any material that is essential to defense.




A few inexpensive tile board panels and some ordinary 2"x2" lumber are all the materials (except fastenings) required to make that old tub look new and modern. If space permits, a handy closet can be built in at the end, as shown below.

The first step is to build a solid frame around your tub, using 2"x2" material. The general appearance of this frame is shown in Fig. 1. This frame goes from wall-to-wall but it can be made shorter in case a corner tub is being worked on. The frame should be put together and fastened to the wall with 3½" screws. This prevents splitting the wood and cracking the plaster. The four upright pieces are fitted around the baseboard by cutting out a portion as shown. The top of the frame must be ⅛" below the lower edge of the roll rim on the tub. This is not much and a little slat this thick should be used as a gauge. Tile board is ⅛" thick.




The next thing is to fit the four panels in place. These are shown and numbered in Fig. 2. No. 1 is fitted in first. The three top panels all fit in under the rim of the tub. Panels 2 and 3 are fitted next. All panels must be a free, easy fit. Use no force when working with tile board. No. 4 is the last panel and it covers the entire front of the frame.

The cabinet space at the end of the tub is lined with plywood and has one shelf. This work is done before the tile board is installed. All edges of the tile board are bound with metal strip. End strip is used everywhere next to the plaster. This means all edges except the upper front corner of the frame and corner strip is used here. This strip is nailed to the wood frame [*Continued on page* 172]

# IDEAS for SERVICE MEN

**SHOES MUST BE SHINED AT ALL TIMES . . .** and a long, slender bag of heavy wool flannel, (Fig. 1) two to three times the length of your shoe brush, is ideal for holding the brush, the dauber and box of polish. Pull it inside out by means of the inside tape, and it makes an excellent polishing cloth for final luster—while, by using the inside for this purpose, the bag will not soil other items with which it comes in contact.

When several sheets of paper must be held together, and no clips or staples available, the method shown will get the job done. Fold down one corner, tear or cut as shown at "A"; (Fig. 2) fold up the tongue of paper as shown at "B," then tuck it under as shown at "C." The papers themselves will tear before this simple fastening will let go.

**SAY, GIRLS**—send your boy friend in the service a small box of paper napkins such as restaurants use. They're most useful in the messhall, and after passing through the dish washing line, and for many other purposes . . . and for sanitary handkerchiefs are preferable to the flimsy tissues usually sold for this purpose.

**RIFLE INSPECTION** is the bugaboo of many a recruit. Seems like the barrel is determined to pick up a speck of lint or dust, or a drop of oil, at the last minute—when you're in line and no chance to use a cleaning rod. And the average inspecting officer regards such a mishap in the light of a personal affront! To keep off the "spud detail," keep a special chamois "pull-thru" tucked in your pocket, and draw it hastily through the bore just before the Sergeant yells "'Ten-SHUN!" Use the chamois dry, and have it a snug fit in the bore—it will pick up everything in its path and leave no lint or raveling. (Fig. 3.)

**RUBBER BANDS**—a small bunch of husky sized ones—will take up little or no room in your service kit, and will prove indispensable for a hundred and one little jobs. You never miss a rubber band till you need one and can't get it.

**A RUBBER STAMP**, with your name in letters about ½ inch high, is very useful for marking textbooks, clothing, and all personal effects. Have a good one made before leaving, and be sure to take along a small inkpad for same.

**A GOOD TURKISH WASH RAG** is a luxury de luxe in camp—and an inexpensive oiled silk tobacco pouch is the ideal container for it—you can put it away while still damp, without damage to other articles.

**WASHING SOX** is important, on a job where you live on your feet. Wash woolen sox only in lukewarm water, with a rich soap lather. Scrub them with a stiff brush, also "knuckle" them thoroughly in your hands; let the rinse water be slightly soapy—very slightly; do not wring them dry—just press out excess water. Never wash black sox in the same water with other clothing. WASH A PAIR OF SOX AND A SUIT OF UNDERWEAR EVERY NIGHT.

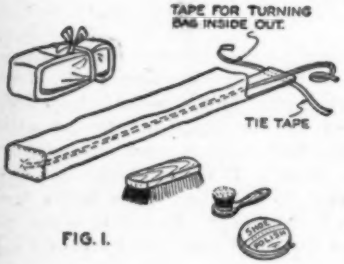



FIG. 1.

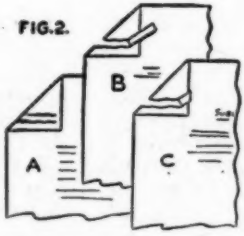



FIG. 2.

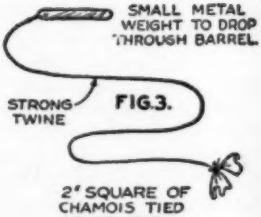



FIG. 3.

**GO LIGHT!** Most recruits, through misunderstanding on their own part and that of well meaning friends, carry a lot of useless junk into the service—only to throw it away on arrival. Your first several weeks will be spent where you'll practically live in your seabag or duffel, and anything which might break (such as glass bottles) and damage the contents of your bag, is strictly out of bounds. The list includes:

| | |
|---|---|
| Hair tonic or oil | Liquor |
| Medicine of any kind | Any firearm |
| Liquid shoe polish | Obscene literature or pictures |
| Ink | |
| Cards or dice | |

Leave all these things at home! Come into the outfit "clean and sober" and with a minimum of baggage. Remember, Uncle Sam supplies *everything* you are permitted to wear. Personal baggage must all be sent home immediately—and sometimes in the rush it may get rough handling. You'll need no hair dope of any kind, because you'll have no hair worth mentioning during your training period. The girl friend's picture? —yes, a small one in your bill fold—you'll have no place to put a large one. Tooth brush and powder, razor, shaving cream, toilet soap—these in a sturdy, compact toilet case; pencil and fountain pen—the camp library will furnish you ink. Toilet articles may be replenished at the Canteen or Ship's Service Store, at less than they'd cost you outside. When leaving home, wear some of your old khaki or other work clothes which you can afford to throw away on arrival, an extra suit of underwear and change of sox if it's a long trip, and two or three handkerchiefs. *That's all.*

**WHEN AND WHO TO SALUTE IN THE NAVY,** often puzzles the naval recruit—particularly men who have had previous army service. The old time Chief Petty Officers with gold hashmarks (commonly referred to as "grave dodgers" —though *not* when they're listening!) do not rate a salute, though more gorgeously bedecked, in some instances, than an admiral or even a hotel doorman. A safe rule is to salute only those men wearing *a gold strap on the front of the cap,* regardless of sleeve insignia. If it's a plain black strap—just pass on and try to appear inconspicuous. Moreover, in the Navy it is customary to salute an officer *only* on first meeting him in the morning, and not again unless he gives you an order or otherwise addresses you. It is correct to say, "Good morning, sir!" when saluting a naval officer—a practice not common to other branches. Whatever you do, DON'T salute the man wearing silver stripes on his sleeves—he's only chief of the station's fire department!

## HOW TO BE UNPOPULAR IN THE NAVY

1. Keep bellyaching about the chow, and flaunt the fact that you have plenty of money and can eat at the station restaurant.
2. Sound off frequently about your previous "training" in the C's. . . . the Navy just loves CCC graduates!—in a pig's eye!
3. Mention casually, as opportunity arises, that you're only marking time in the ranks—that you have a Congressman friend who's going to get you a commission as a "public relations" or "recreation officer" before long. Hot diggety!
4. Keep running to the company office for some special favor every now and then—and tell the "Chief" how much you can help him run the company as it should be. Keep yourself in the limelight—you've no idea how many "important" duties you'll acquire, such as "graveyard" watches, deck swabbing, garbage truck details, and perhaps a day in the scullery now and then.
5. Let everyone know that you're much too good for the Navy—that you came in just one jump ahead of the draft. Wow!—how the Navy loves a draft dodger!
6. Don't bother addressing your Company Commander as "Mister So-and-so"—just holler "Hey, Chief!" when you want something. That'll let him know you're wise to him—and probably get you a mid-watch.
7. If you want a few days leave, and can't get it—just have your folks send you a wire

[*Continued on page 166*]

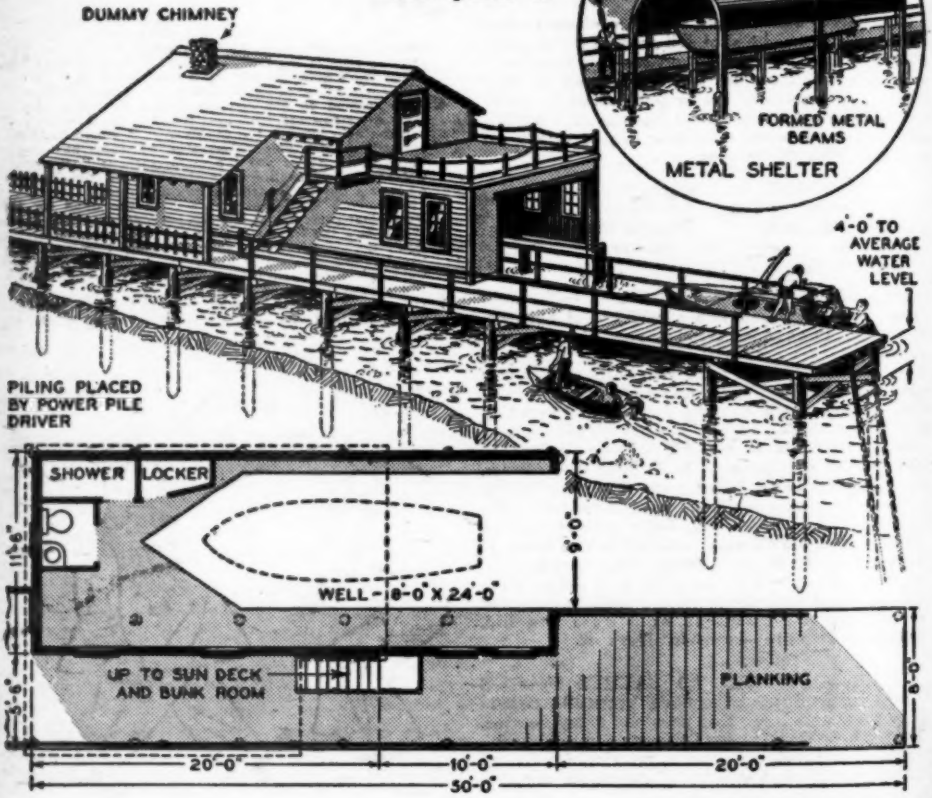
# DESIGN FOR

RIGGING USED FOR DRIVING LARGE PILING

**Some hints and suggestions for building the boathouse or dock best suited to your needs.**

A DOCK, with or without a boathouse atop or alongside it, improves the value of any property on the water, adds years to the life of your boat, and can be a money-making proposition if built large enough to shelter another boat in addition to your own. Covered storage, or even wharfage, is always in demand. Using good used lumber and doing the job oneself or with the help of a few friends the building cost can be kept very low. And it can even be spread over several years by putting in the dock or underpinning first but designing it to take the boathouse structure at a later date.

First points to

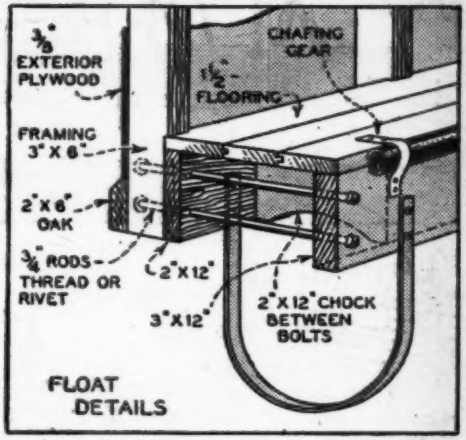


# DOCKING

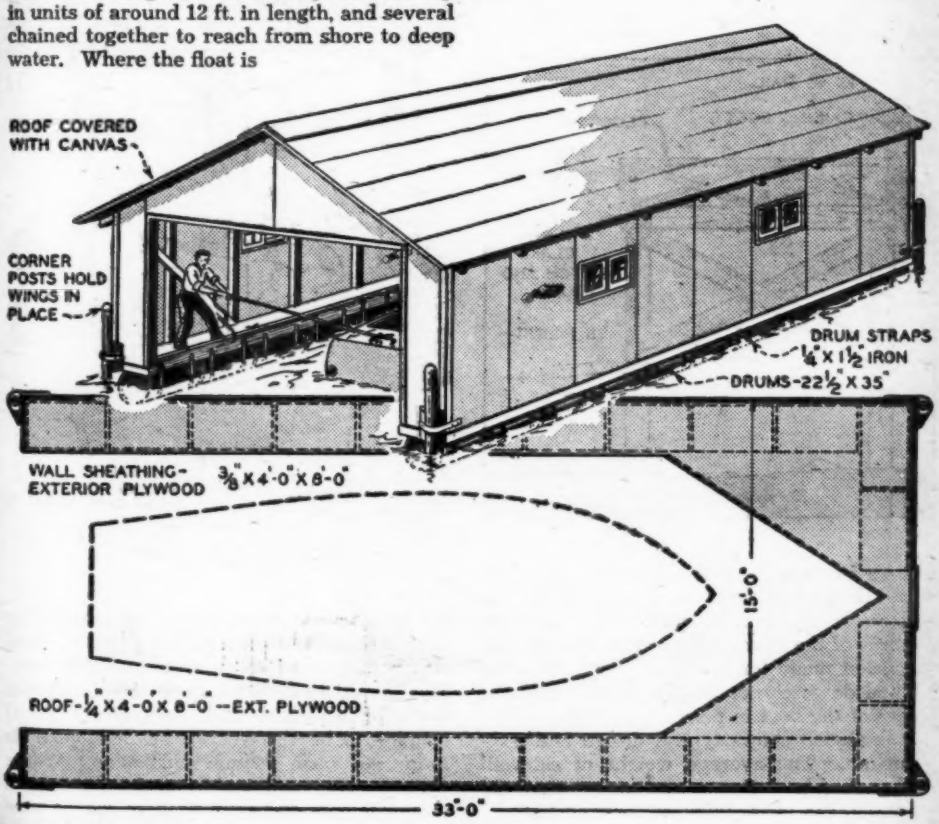
by J. A. Emmett

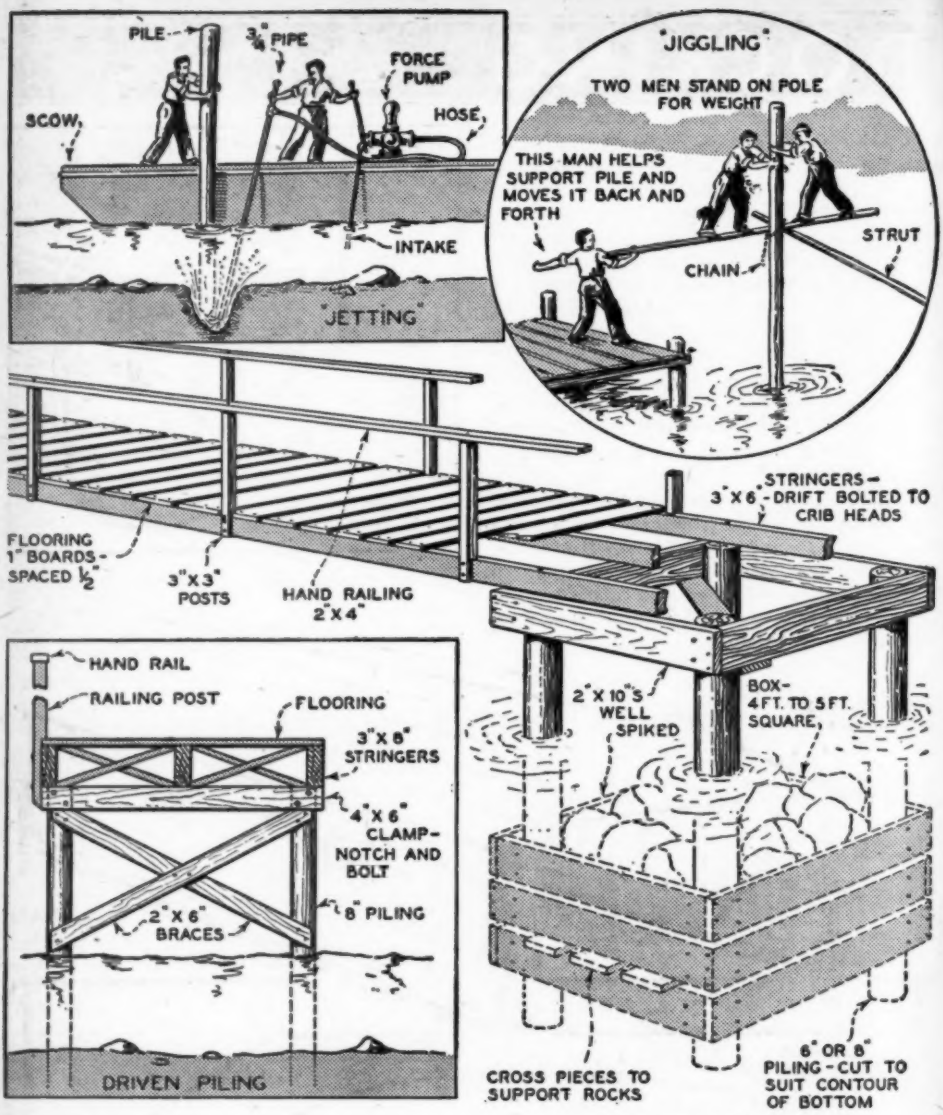
consider are the location as regards exposure to waves or changing water levels, and the type of bottom over which the dock must be set up. It will be folly to build out into the water on an open shore where winter storms are apt to smash anything built out, or if the water level is subject to seasonal changes as characterizes rivers draining high country. In either case, some type of float which can be hauled clear of high water or waves will be the better proposition.

Floats may be built of old oil drums, or of logs or heavy used timbers from some wrecking yard. A standard 55 gal. drum will support approximately 400 pounds net weight, providing ample flotation for any crosspieces and decking which may be built over a number of them to make an ordinary float. For easier handling such floats may be made up in units of around 12 ft. in length, and several chained together to reach from shore to deep water. Where the float is



FLOAT DETAILS

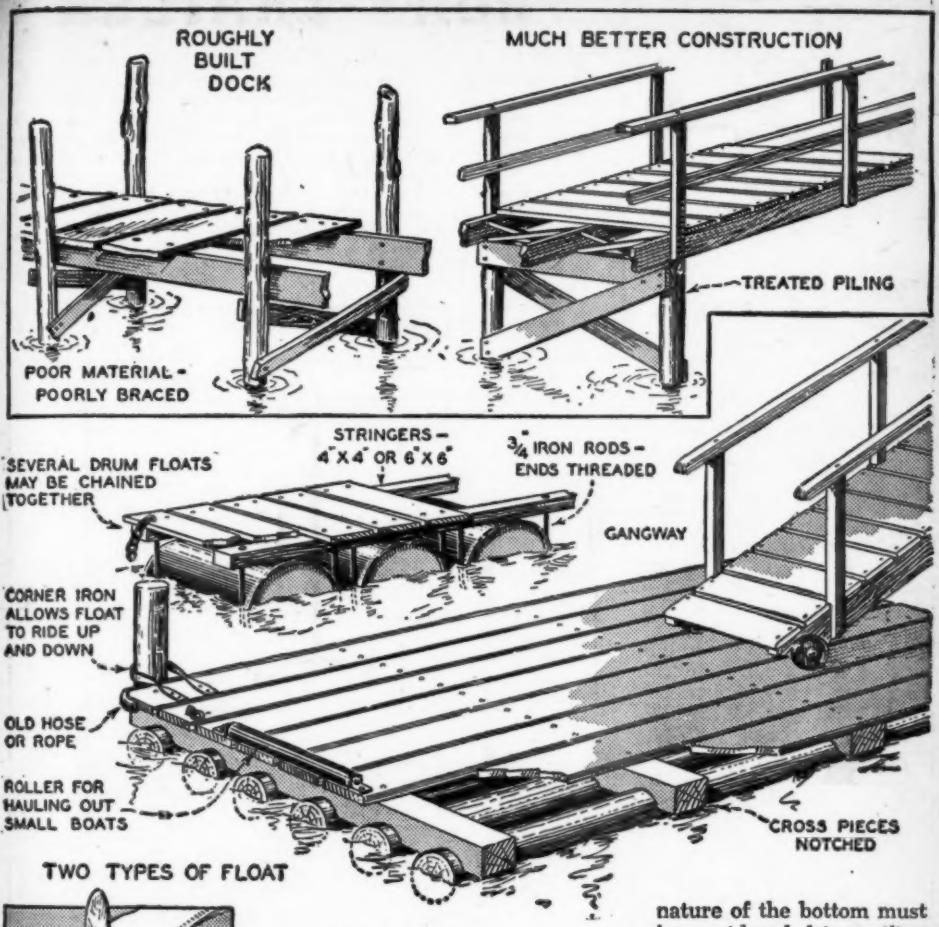

ROOF COVERED WITH CANVAS
CORNER POSTS HOLD WINGS IN PLACE
DRUM STRAPS ¼" X 1½" IRON
DRUMS-22½" X 35"
WALL SHEATHING- EXTERIOR PLYWOOD 3/8" X 4'-0" X 8'-0"
15'-0"
ROOF-¼" X 4'-0" X 8'-0" -EXT. PLYWOOD
33'-0"




ROCK FILLED CRIB

to take a boathouse it is best to design it as a drive-in or well type as shown. Here the drums are laid end to end being tied to the timbers of the framing by rods or straps, and provision made for straps or chains to slide up and down corner posts and help hold the wings of the float in place.

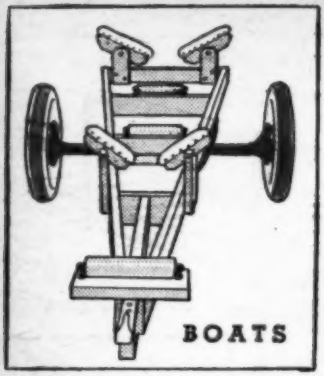
The sketch shows typical design and construction. The average weight of sidewall and roof of light tongue and groove material or of exterior grade plywood for such a structure will run approximately 90 pounds for each lineal foot of wall imposing a dead weight of 270 pounds on each 3 ft. long drum. This leaves a safety factor of 150 pounds per drum or ample to take care of additional weights to be thrown on the float, possible failure of some drums, and so on. Where drums are not obtainable, or for the sake of economy, logs or heavy timbers can be used


ROUGHLY BUILT DOCK
MUCH BETTER CONSTRUCTION
TREATED PILING
POOR MATERIAL - POORLY BRACED
STRINGERS - 4"X4" OR 6"X6"
3/4" IRON RODS - ENDS THREADED
SEVERAL DRUM FLOATS MAY BE CHAINED TOGETHER
GANGWAY
CORNER IRON ALLOWS FLOAT TO RIDE UP AND DOWN
OLD HOSE OR ROPE
ROLLER FOR HAULING OUT SMALL BOATS
CROSS PIECES NOTCHED
TWO TYPES OF FLOAT

in much the same way. No definite rule can be laid down as to their flotation as various woods will be used, the usual plan being to use lightweight wood and enough members to provide flotation well in excess of what is apt to be required. Where logs or timbers are to be merely tied together and decked over for a simple float it is easy to judge as to flotation as the building progresses.

Smaller rivers, coves, and sheltered bays are best suited to permanent docks. Here, whatever the size or type of structure the nature of the bottom must be considered, driven piling being suited to soft sand or mud but rock bottom making rock-filled cribbing necessary. Certain general principles of building apply to rock-filled cribs whether or not the dock is to take a boathouse. In case a boathouse is to be erected atop or alongside the dock the formation in which the cribs are sunk will have to be made accordingly, but their construction and handling will be the same as for an ordinary dock.

Cedar is, in many sections, an easily secured wood for crib building; it lasts well in water and is easily worked and handled. White oak is another durable wood, and because of its strength members can be smaller than if of soft wood. Pine, fir, and other woods, especially when used for corner posts, should preferably be creosoted, or treated with some preservative. Using [*Continued on page* 168]



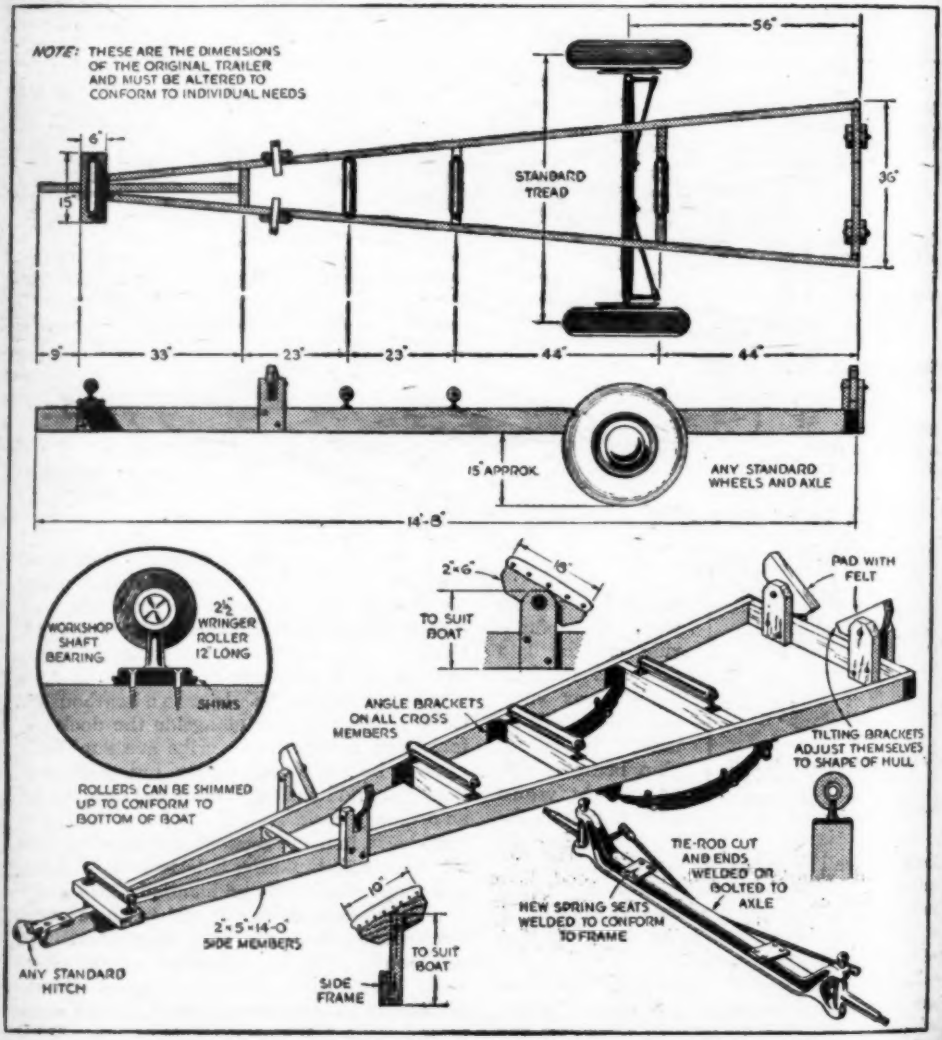

# BOAT TRAILER

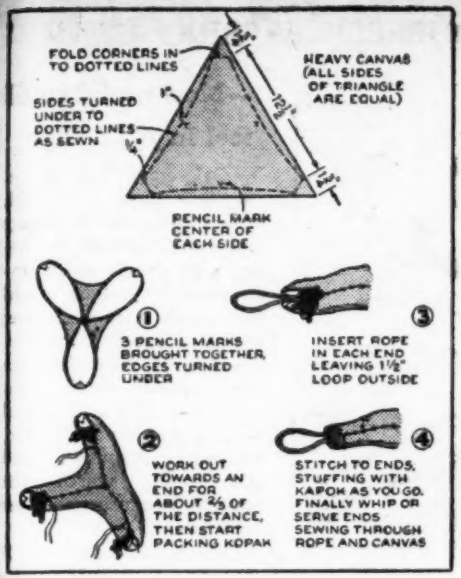
RUBBER rollers (or wooden rolling pins) make it easy to slide a light sailboat (up to 21 ft. in length) aboard this clean-cut trailer, and adjustable brackets prevent rocking once the craft is lashed down.

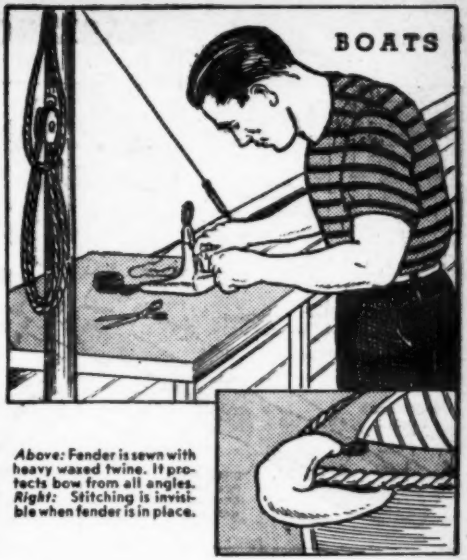
Construction is a simple job of carpentry, as all assembly is done with screws or bolts and there are no intricate features. Hardware is standard throughout, and provided with a pair of auto wheels and axle, as well as springs, the cost is reasonable.

Side members are 2 x 5's 14-ft. long, forming a slim triangle and braced with wood cross-members secured with angle-brackets. Four standard wringer rollers are mounted on shaft bearings, and these can be raised where necessary to conform to the bottom of the boat by inserting shims of sheet iron. Tilting brackets are padded with felt or carpet material, copper-tacked.

Owing to the relatively narrow frame new spring seats should be welded to the axle at the required angle.—*Hi Sibley.*




FOLD CORNERS IN TO DOTTED LINES
HEAVY CANVAS (ALL SIDES OF TRIANGLE ARE EQUAL)
SIDES TURNED UNDER TO DOTTED LINES AS SEWN
PENCIL MARK CENTER OF EACH SIDE
1
3 PENCIL MARKS BROUGHT TOGETHER, EDGES TURNED UNDER
2
WORK OUT TOWARDS AN END FOR ABOUT ⅔ OF THE DISTANCE, THEN START PACKING KOPAK
3
INSERT ROPE IN EACH END LEAVING 1½" LOOP OUTSIDE
4
STITCH TO ENDS, STUFFING WITH KAPOK AS YOU GO. FINALLY WHIP OR SERVE ENDS SEWING THROUGH ROPE AND CANVAS



*Above:* Fender is sewn with heavy waxed twine. It protects bow from all angles. *Right:* Stitching is invisible when fender is in place.

## BOW FENDER FOR DINK

THIS tripod type fender will protect not only the sides but the top of your dink's bow, preventing marring of both dinghy and other boats against which it may bump.

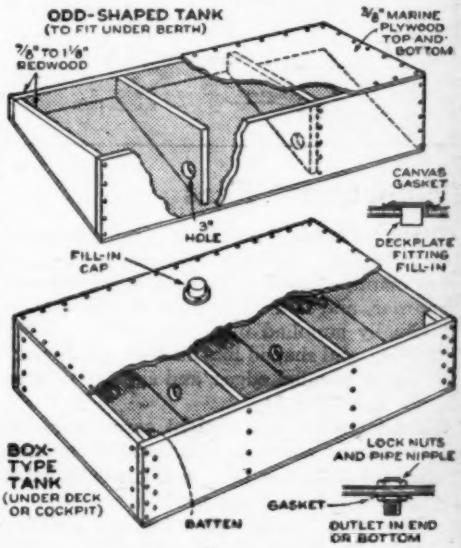
The pattern shown will give a fender the correct size for the average small or medium size open boat—the making is shown in the sketch and photographs. Half a pound of kapok may be bought for the job, or enough pulled from a discarded boat cushion, and stout twine used for sewing and serving should be doubled and waxed for strength.

To fasten the completed fender to the bow use small galvanized wire staples, driving a couple for each lower prong over the rope loop and into the rubbing strip about the boat, stretching prongs back tightly as you do this. Then pull the upper prong back and fasten.

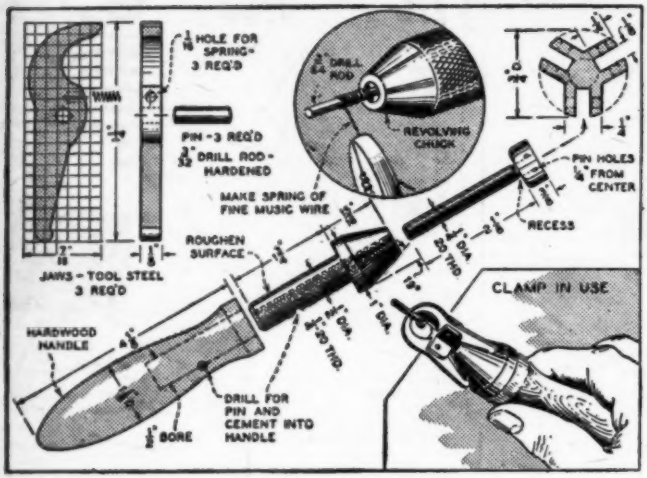
## WOODEN WATER TANK

ALTHOUGH a wooden tank keeps water in better condition than a metal one, and if homemade costs but the value of lumber used, they are not widely employed because of the difficulty of making them leakproof. The secret here is to not rely on any swelling of the wood or closeness of joints for tightness, but to first make the tank in as rigid a manner as possible of redwood and marine plywood, which swell or shrink but little, then depend on an inner coating of paraffin to keep water in.

Typical construction is shown. The sides and ends should be made of redwood, ⅞-in. thick for up to 40 gallons capacity, 1⅛-in. above that, and the bottom and top of ⅜-in. marine plywood. Center supports, also redwood, should have large holes bored in them low down as they not only act as braces but prevent too rapid [*Continued on page* 172]



# MAKE YOURSELF A "RING CLAMP"




## —Most useful small tool in ANY shop

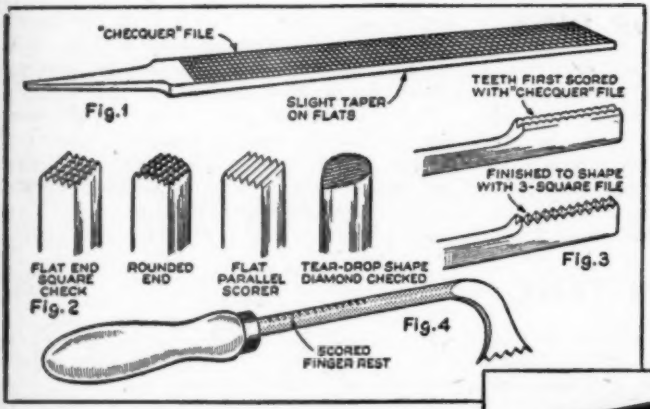
YOU can't buy it; in these days of O.P.M. orders and priority ratings you can't borrow it, because no owner of this indispensable gadget would take such a fool chance; and you mustn't steal it, because if you did, the owner would surely shoot you down like a dog, and no jury would convict him. So you must make it—and it's easily worth the trouble, because *you must have it!*

Drawing at left shows it complete (corner); and its components (center). Size is largely a matter of preference, though a screw shank ranging from $\frac{3}{16}$" to $\frac{1}{4}$" in any thread available, will surely get the job done.

All parts should be made of round or flat drill rod or other high-grade tool steel (about 80 to 90 point carbon) and shaped as shown.

Handle may be made of

[*Continued on page* 174]



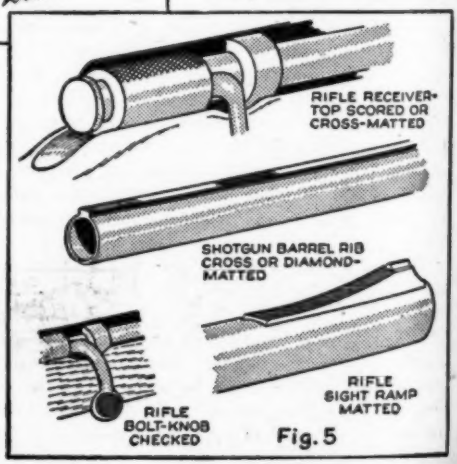

## "Checquer" Files

THE "checquer" file illustrated here seems to be little known to most mechanics; yet it is manufactured by at least two American factories, and is a staple item in Europe. It is usually supplied in 8-inch length, ½" or ⅝" wide, and shaped like an ordinary "pillar" file—with parallel edges, and slightly tapered on the flats (Fig. 1).

The teeth are cut straight across, and the file is deeply grooved with parallel channels running lengthwise, the spacing usually being either 18 or 28 lines per inch.

Such files open surprising possibilities, both to the home

[*Continued on page* 174]


RIFLE RECEIVER-TOP SCORED OR CROSS-MATTED
SHOTGUN BARREL RIB CROSS OR DIAMOND-MATTED
RIFLE SIGHT RAMP MATTED
RIFLE BOLT-KNOB CHECKED
Fig. 5

# Record Rack

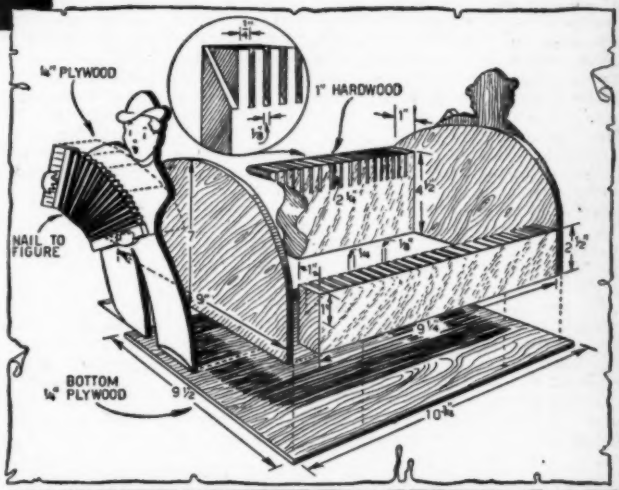
**Now that it's hard to replace your records, keep them safe in this rack.**

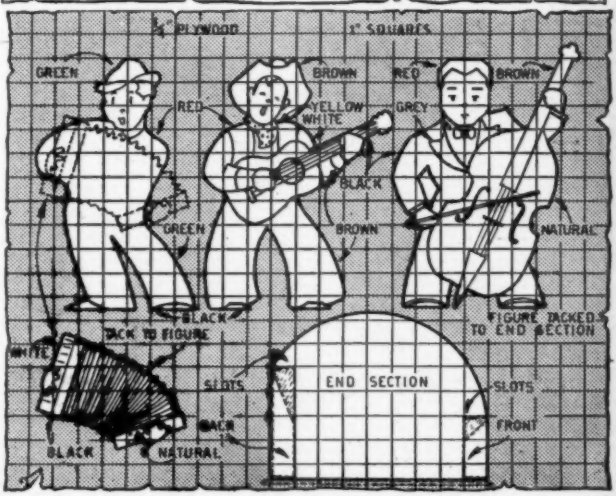
by
R. L. Fairall

RECORDS selected for an evening's entertainment are kept orderly and safely in these comic wooden racks while they are in use.

Cut the front section, 9¼"x2¼", and the back section, 9¼"x4½", from 1" hardwood; saw the slots for the records in these pieces as indicated in the squared drawing. Saw out the end sections and the bottom, 10¾"x9½", from ¼" plywood, and nail them together as shown. Trace the figure twice to ¼" plywood, and jigsaw them out. Tack or glue the figures one on each end section. Stain the rack and paint the figures with shiny enamel.

Be certain that all slots in which the records are to be set, are wide enough to permit them to be easily inserted and removed. It is wise to try the slots on the edge of a record before assembling the rack. Then if any slot is too tight a fit, it can be quickly widened. Base of rack should have felt pads or rubber feet.




Use squared sketch at right for figures, sketch above for assembly.

# THE SCHOOL SHOP

Conducted by Frank Petraglia,

*Shop Instructor, Samuel Gompers Industrial High School*
*New York City*

## HOW TO READ A MICROMETER

THE micrometer is one of those basic measuring instruments with which everyone should be familiar. Perhaps because of their expensiveness, they are not generally encountered in most home workshops. Hence, the occasion is not always offered to work one of these instruments, and so it will be no surprise if a great number of you school-shoppers are in the dark as to just how thousandths of inches are measured with this precision tool and the simple arithmetical calculations which are necessary when reading the micrometer.

The micrometer finds its greatest use where machine parts must be cut to exact dimensions. The human eye may be fairly accurate in gauging sixteenths, or even thirty-secondths, of inches. When it comes to thousandths, you are lost without the micrometer. This article will concern itself with the common type of "inch" micrometer, illustrated herewith, which is used for everyday metal thickness measurements. Of course, various modifications are found in micrometers for special work.

By applying some principles of simple arithmetic, the micrometer measures thousandths of an inch in this manner: the instruments scale on the barrel is divided into 1/40 in. graduations, each of which is then subdivided into 1/25 by reading the thimble. Since one-thousandth part of an inch is 1/25 of 1/40, we obtain this measuring ability in thousandths by the combination of barrel and thimble readings. However, let us first consider some of the construction details.

The stock to be measured is held between the anvil and spindle. Through the center of the barrel and the thimble run threads which serve as a nut in which a screw can be operated. In this case the spindle acts as the screw and possesses 40 threads per inch. One complete revolution of the spindle causes it to move backward or forward 1/40 in. and, it follows, that 1/25 turn will cause a movement equal to 1/25 of 1/40, or .001 in. With this, it is only necessary to gauge 1/25 of one turn and this measurement is provided by the thimble. The thimble is graduated into 25 marks around its circumference, suitably numbered, so that the number of marks which have passed a fixed line on the barrel can be counted. A study of the illustrations and the following further description will help to clarify the above.

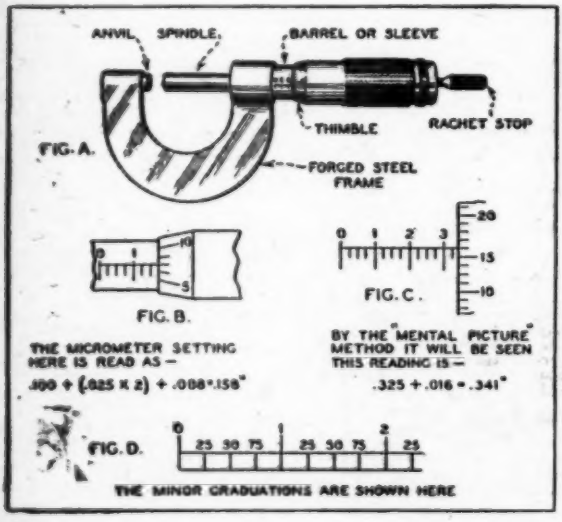
### Reading the Micrometer

Micrometer readings are always expressed in decimals, and it is usual practice to engrave a table of decimal equivalents on the frame for use when fractional dimensions have to be used. These need not concern us here. To read a micrometer, the following considerations must be taken into account. The sleeve or barrel has marked on it divisions representing tenths of an inch, or .100 in. each. Every major division is then subdivided into four minor ones which represent .025 in. each. The thimble is divided into 25 parts, and since one full turn of the spindle is equal to a minor division on the barrel, then one division on the thimble will be .001.

Let us take an example. To read the setting as shown in Fig. B count the number of tenths, or major divisions, add the number of minor divisions multiplied by 25, and then add the number on the thimble. Thus the setting in Fig. B is .100 plus (25x2), plus .008, which equals .158 in.

For another example, consider Fig. C. Here it will be seen that the reading is .325 plus .016, or .341 in. That is really all there is to it.

To operate a small micrometer with one hand, as is usual practice, hold the thimble between thumb and index finger of the right hand with your third finger hooked into the loop of the frame. The instrument thus rests in the palm of the hand. The work may then be manipulated with the left hand for measurements.



## Talking Shop

A NEWLY created Civil Service category which has absorbed, and continues to absorb a great number of young vocational school students and home workshoppers is the newly-created classification of "Mechanic-Learner." Whatever your background, the principal requirement seems to be mechanical aptitude. After passing simple qualifying tests, the mechanic-learner is enrolled in a two or three months pre-employment training course in some special skill. The pay is generously high on the pre-employment level; upon graduation, it rises further. If interested, get in touch with your local trade school authorities.

---

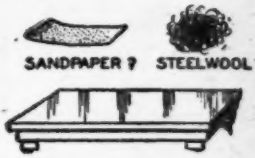
"Pre-aviation training" is the answer to the young model builders prayer. No doubt you've learned all about the pre-requisites in your own schools. If not, the plan is to help you young fellows who are still in school to lay in a good foundation in physics, mathematics and physical education before you get around to the first solo flight later on.

---

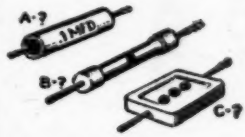
New York City has signed up 7,000 boys of junior and senior high school age for farm work this summer. Well, that's a pleasant change—from the school and home workshop to the furrowed fields!

1. Lumber is sold by the board foot. How many board feet are represented below?

2. In rubbing down a shellacked or lacquered surface which is preferable—

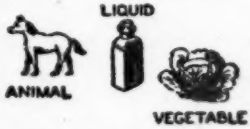



3. Your radio contains these three parts. Which are condensers? Resistor?




4. The tools below are both used for removing shavings from a rough wood surface. What are their names?

5. Of these three types of glues—




Which is the most satisfactory for use in woodworking?

6. Which of the electrical formulas below applies to direct current? Alternating current?

1. $E = IR$
2. $X_L = 2\pi FL$

HOW MANY OF THESE QUESTIONS CAN YOU ANSWER? You should be able to get at least four of them—but if you're stuck turn to page 176 for the answers.

## MI SHOP SCRAPBOOK INFORMATION SHEET

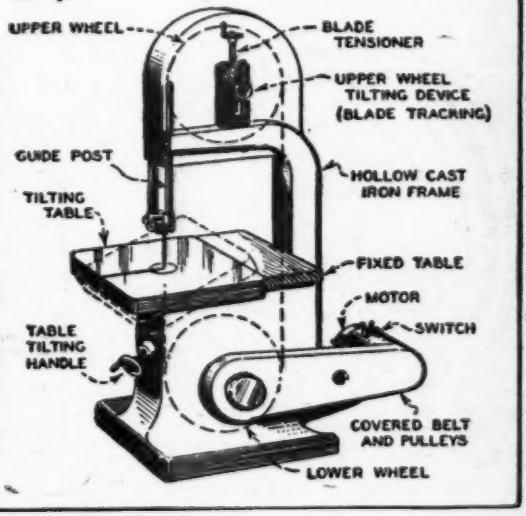
### The Bandsaw

The bandsaw is a widely used machine-tool which can cut practically any combination of straight and curved patterns in wood or metal. This is made possible by means of the position of the flexible saw blade, which runs over an upper and lower pulley wheel at speeds up to 600 r.p.m., giving a blade speed up to 2,200 feet per minute. Usually the upper wheel is adjustable, being capable of a vertical and also a tilting backwards or forward motion. The vertical movement provides tension adjustments to the saw; the tilting movement is for "tracking" the saw, that is, making it run on a certain part of the rim of the wheels.

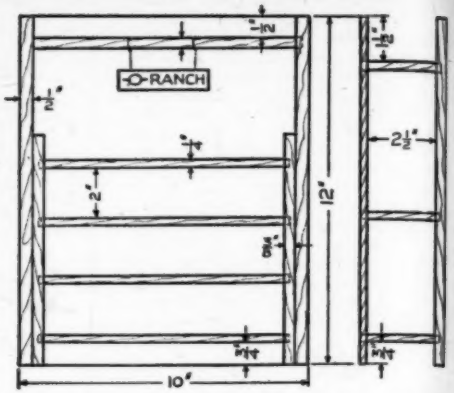
The large table through which the saw runs can be tilted 45 deg. to the right and 10 deg. left, these motions making complex wood cuts possible. The handwheel, illustrated, is the adjustment control. Two guides are used for the saw blades, one above and one below the table. The upper is fastened to a guide post, which is a heavy steel rod sliding in a bearing on the column of the casting. This is counter-balanced by a spring, so that upward or downward motion is possible and adjustment may be made to suit the thickness of the stock to be sawed.

Bandsaw blades are made for both wood and metal working, differ in widths from ⅛ in. up and varying in size according to the number of points per inch. Blades are interchangeable, as a wood-cutting blade naturally cannot be used on metal.

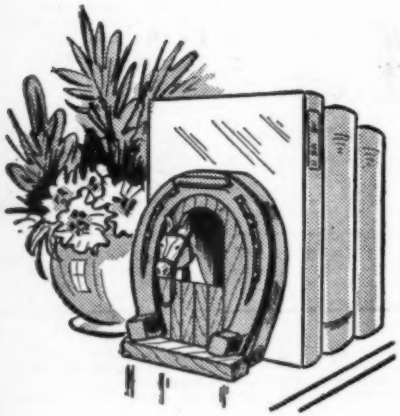
Within recent years small, economically priced bandsaws have become available to the home craftsman. The important considerations when purchasing such a saw are ruggedness, and one that has a heavy, substantial frame that will not vibrate under continued running.



## Ranch Gate Tie Rack

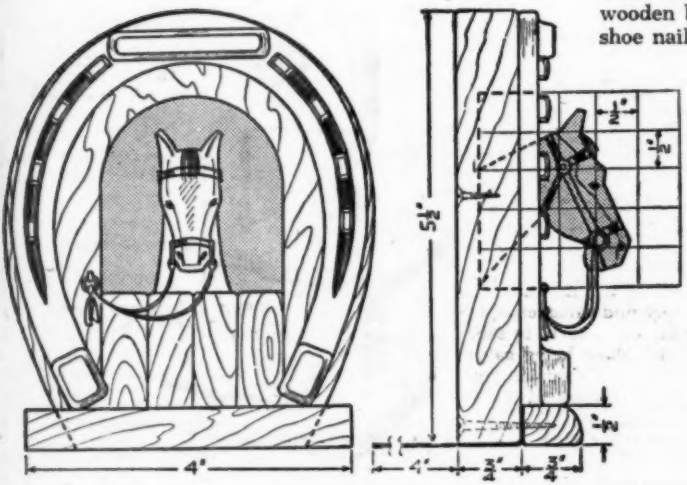


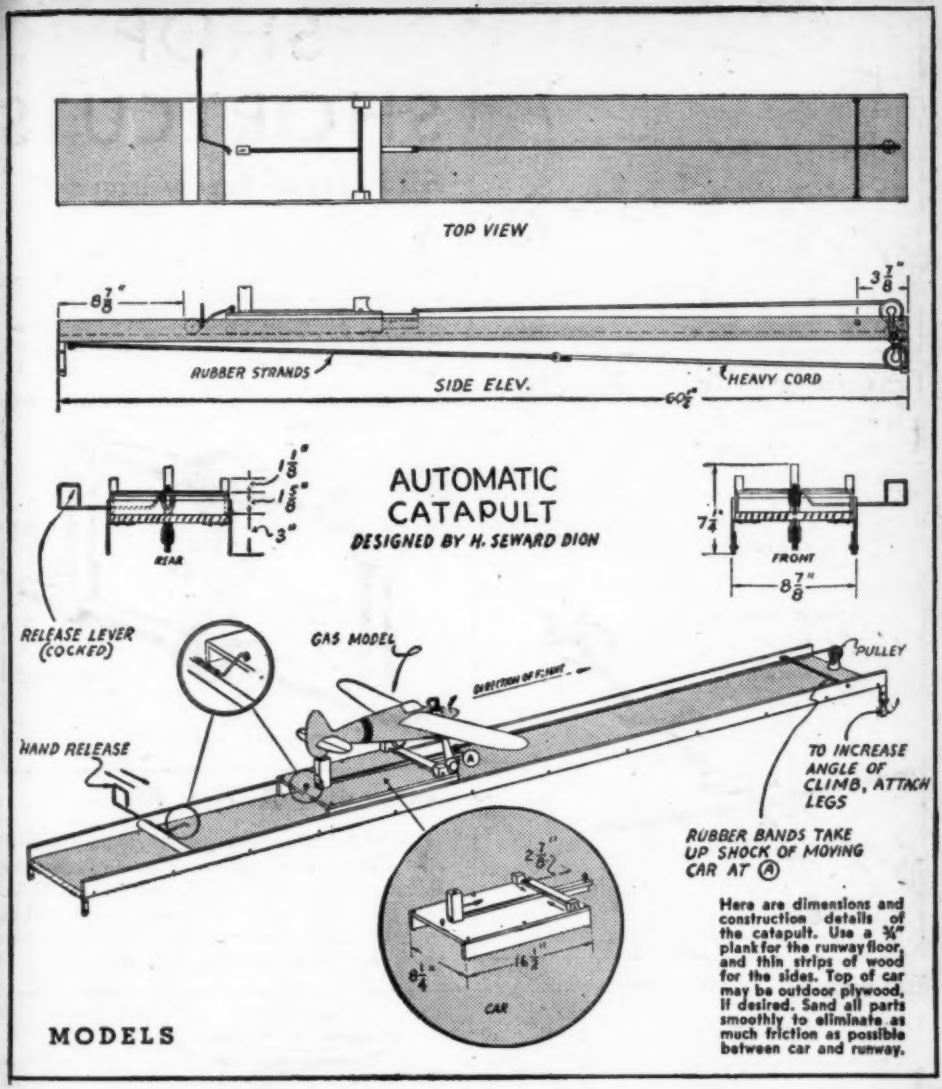

SOME dowels and a 10-inch by 12-inch piece of quarter-inch plywood are about all you need to make this tie rack with a hand painted ranch as a background. The main "gate posts" are ½-inch dowels. Nailed to the inside surfaces of the gate posts are the ⅜-inch dowels that form the uprights of the gate. The cross rails of the gate, and those which join the gate posts to the plywood, are ¼-inch dowels. The top rail between the gate posts is a ⅜-inch dowel. Gray stain and varnish finishes it.—*D. C. M.*



## Horse Shoe Book Ends

A FEW scraps of ¾-inch white pine and a pair of size-0 horse shoes form the main items in this attractive set of book ends. The horse shoes are fastened to the wooden backs with regular horse shoe nails. The nails are clipped and filed flush on the other side. The horse's head is jigsawed from a piece of the same size stock as the rest of the project. After jigsawing it, a little careful penknife work will make a fairly realistic head. The recess in the wooden back, in which the head is set, may be made with a chisel, and is shaped like top of a stable door. The bridle is of wire.—*D. C. M.*




TOP VIEW
RUBBER STRANDS
SIDE ELEV.
HEAVY CORD
AUTOMATIC CATAPULT
DESIGNED BY H. SEWARD DION
REAR
FRONT
RELEASE LEVER (COCKED)
GAS MODEL
PULLEY
HAND RELEASE
TO INCREASE ANGLE OF CLIMB, ATTACH LEGS
RUBBER BANDS TAKE UP SHOCK OF MOVING CAR AT A
CAR
Here are dimensions and construction details of the catapult. Use a ¾" plank for the runway floor, and thin strips of wood for the sides. Top of car may be outdoor plywood, if desired. Sand all parts smoothly to eliminate as much friction as possible between car and runway.
MODELS

# Model Plane Catapult

[*Continued from page* 113]

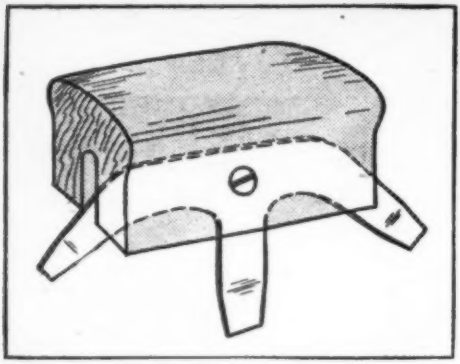
Obviously, we can't all be pilots and fly from aircraft carriers and battleships, but if you are a model builder you will surely find satisfaction in building this model catapult, and a thrill in seeing your own gasoline model plane being catapulted into the air. With a minor conversion you may easily substitute a glider instead of a gas model, if you desire.

This launching device is relatively simple in construction and can be built in a short time without expenditure of more than a couple of dollars.

## Catapult Track

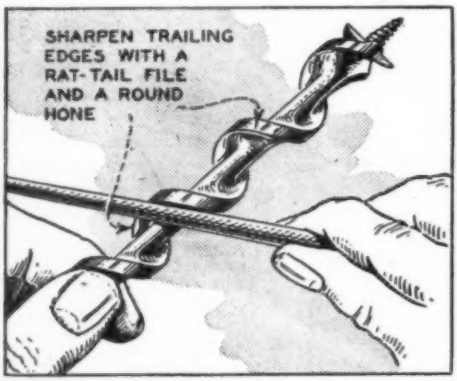
Cut the necessary pieces for the runway and car to the dimensions given in the drawing. A plank ¾" thick and 8½" wide is used for the bottom. The sides are quarter-inch smooth lathe, and are attached to the bottom with screws, as indicated. A saw, hammer, screwdriver and perhaps a block plane are about all the tools you'll need for cutting and assembling. With the runway completed and metal (angle iron) leg plates can also be fastened on [*Continued on page* 176]

# SHOP SHORTCUTS



## Emergency Valve Repair

IF THE threads of a valve mechanism fail on a line that cannot be shut off for repair, mount another valve above it as shown. Bolt the handwheels together, so that when the upper valve is opened, it screws out, closing the lower one, and vice versa.—*W. F. S.*

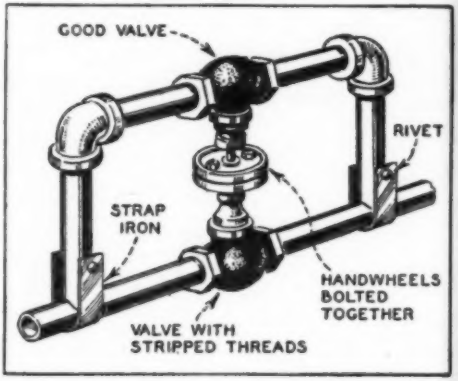



## Refinishing Tools During Wartime

CERTAIN types of lacquers and enamels commonly employed in refinishing tools and other metal work, are now difficult to obtain due to war conditions. A satisfactory substitute that may be used on many tools around the workshop is stove blacking. Clean the surface to be refinished, and apply the stove blacking with a pipe cleaner. The finish produced will be hard to distinguish from the original black finish. It can also be applied with a rag, and when dry, has the advantage of considerable resistance of the effects of heat.—*K. M.*

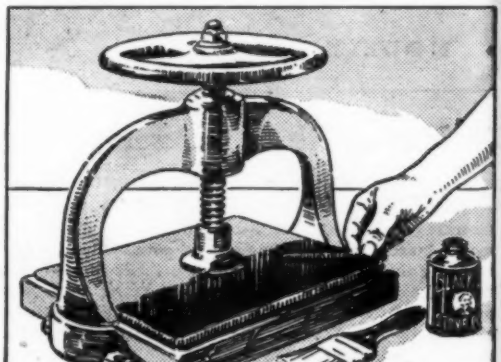
## All Purpose Screwdriver

A PIECE of steel sheet about $\frac{1}{16}$" thick, hacksawed and filed to the shape shown, makes a handy all-purpose screwdriver when mounted in a wooden handle. Cut and file the three blades to different sizes to fit small, medium, and large screws. Fasten to handle with screw.—*I. J. S.*



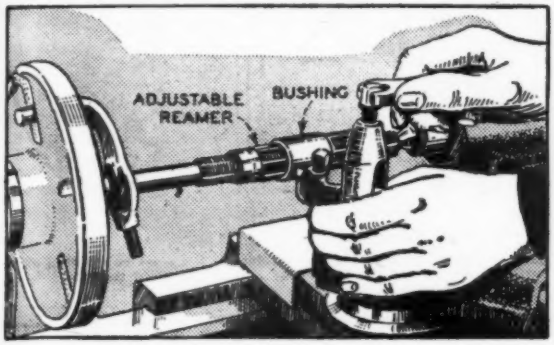

## Improved Augur Bit

AN AUGUR bit will cut a cleaner hole if trailing edges of vanes at shank end are sharp. Use a rat-tail file and round hone. Sharpen vanes so cutting edge is beveled in slightly from outer surface. Don't reverse bit to remove from hole.—*J. D. H.*



## Checking Thermometers

IF A thermometer reads inaccurately, remove it from the boiler, and place its base in boiling water. Then adjust scale by loosening screws. Place boiling point at top of mercury column.—*S. H. C.*

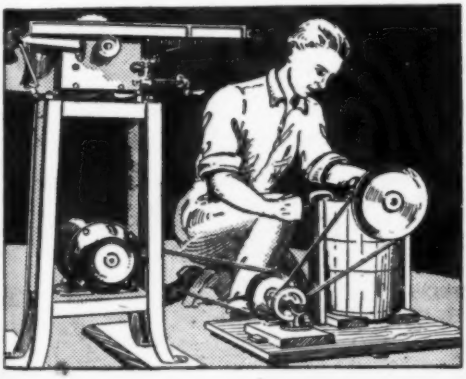



## Machining Bushings

AN ADJUSTABLE reamer, expanded inside of a bushing to be machined on its outer surface, will hold it firmly and accurately in lathe.—*B. N.*

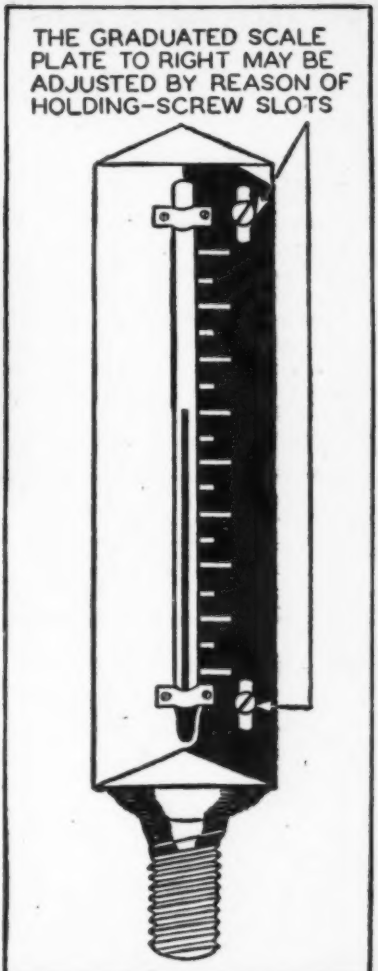
## Circular Saw Ice Cream

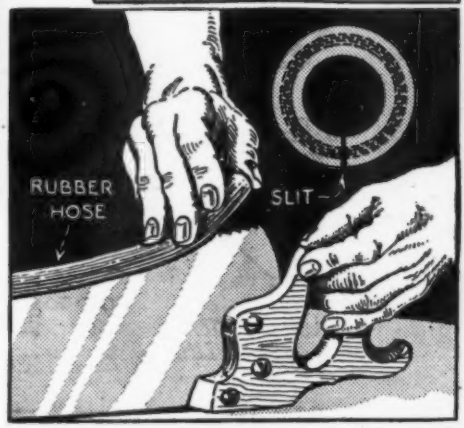
THE circular saw can provide the power for your ice cream freezer when pulley belts are rigged as shown. Arrange pulley ratios so that freezer turns slowly. Weight of freezer keeps belt tight.—*W. F. M.*



## Protecting Saw Blades

SAW BLADES carried in a tool box or left in the workshop cabinet frequently cause painful scratches. Other tools occasionally damage the saw teeth. To prevent either trouble, slit a piece of hose to fit over teeth as shown.—*W. S.*

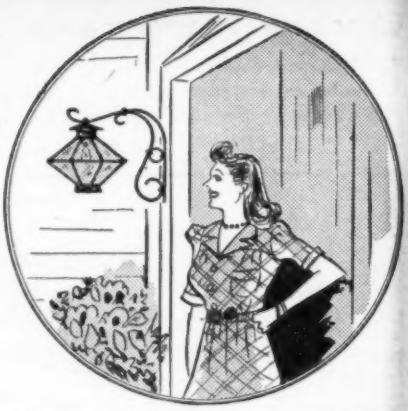


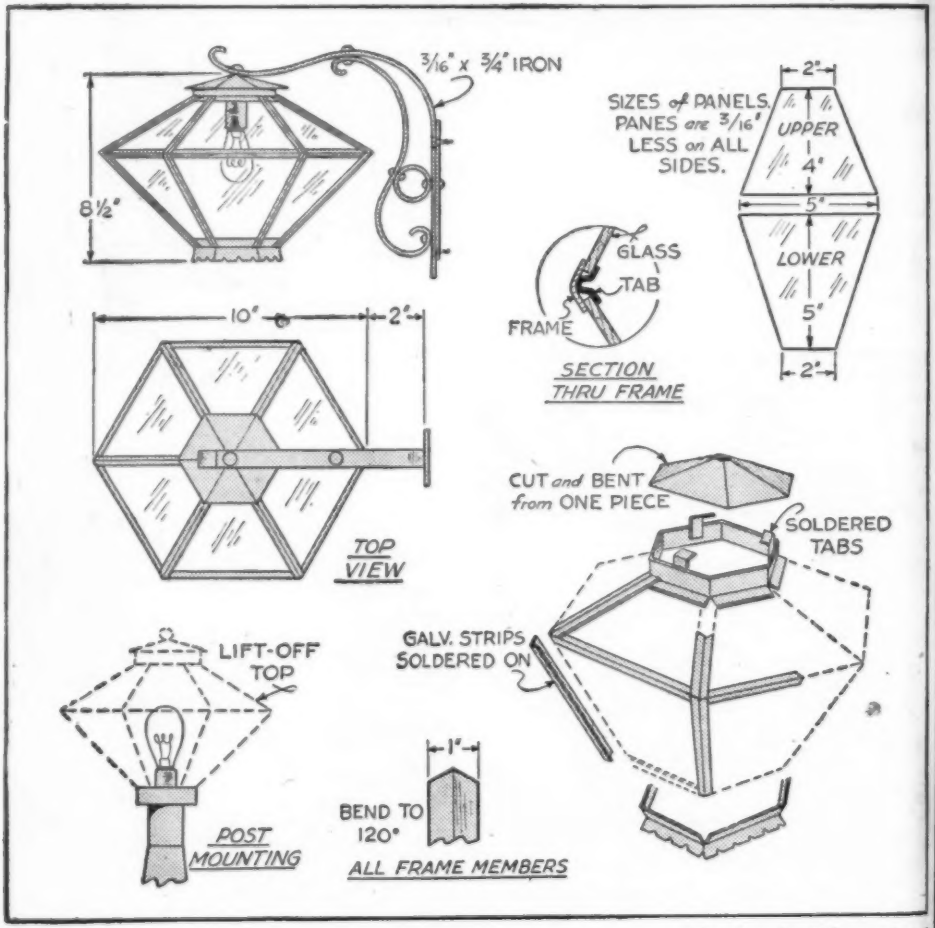
# PORCH LANTERN

by Hi Sibley

THE flattened, "diamond" design of this simple porch lamp is novel as well as pleasing, and it can be constructed of scrap sheet metal from your junk box. Strips of galvanized sheet iron of fairly heavy gauge are suitable. Make the top and bottom units first, then the hexagonal frame to which the strips forming the panels are soldered. A good job will be insured by having a tinsmith cut and bend the strips to the proper angles. Glass panes are cut $\frac{3}{16}$-in. smaller all around than the panels and held in place with tabs soldered inside the frame members. The bulb is replaced through the open bottom in the wall type, and through the lift-off top in the post arrangement.



This attractive and durable lamp can be mounted either on the wall or on a post. Drawings show both types.



# How to Get the Most from Your BLACKOUT FLASHLIGHT

**Follow these OCD-reviewed suggestions to make your flashlight serve best and last longest**

Don't unshield your flashlight in a blackout unless necessary. Further, never point it upward or at highly reflective surfaces.

WHEN Americans suddenly found themselves undergoing blackouts a few months ago, the wide usefulness of the ordinary flashlight was multiplied and newly appreciated everywhere the handy item's efficiency had been taken for granted. Flashlights suddenly became important as it was realized that the wrong type of light, or improper use, could endanger whole cities or war industry districts.

Proper care and use of flashlights received additional emphasis as existing supplies of cases, batteries, and other parts were reduced through purchasing accelerated by the circumstance of war. Production of more was limited by the scarcity, or war manufacturer's greater need, of raw materials. No lack of flashlights exists, and to make sure none occurs it's essential that wasteful handling and use of them are avoided. Conservation is a watchword of wartime life in respect to small appliances like flashlights as surely as to large ones.

Advice on conserving your useful blackout flashlight, so that it will give optimum service and last the longest possible time, has been assembled by the makers of "Eveready" flashlights from technical experts, Army engineers, and civilian defense agencies. Their suggestions, reviewed and passed by the OCD:

To shield your flashlight, cover lens with two thicknesses of newspaper held by string as in Fig. 2 above. Or cut two disks of paper and insert under lens (Fig. 3). Red paper is approved, too—but not blue.

Use a dummy cell of wood with a metal strip as above to cut down your flashlight's power and also cost of its operation.

a. Every home should have one or more flashlights. But before buying new ones, inspect and repair your old ones. They may need only a new bulb, new lens or fresh batteries.

## Your Blackout Flashlight

[*Continued from page* 147]

**b.** Keep your flashlight in a convenient, accessible place—and always in its place. When using it INDOORS, never point it toward unshielded windows, skylights or open doors.

**c.** Do not use an unshielded flashlight OUTDOORS in a blackout except when absolutely necessary. Keep the beam level or downward—never point it even slightly upward. And never point it toward highly reflective surfaces. See Fig. 1.

**d.** To shield your flashlight for outdoor use: Cover lens with two thicknesses of newspaper or similar paper, held in place by string. Fig. 2. Or, cut two disks of paper and insert under lens. Fig. 3. Deep red paper may also be used (blue is unsatisfactory).

Red is the best for use during a blackout, white second best and blue the poorest. For reducing the power of any flashlight, red or white, there are other methods than obstructing the beams with paper as described in the instructions above. These alternatives call for more effort but are more economical in producing the same results.

For instance, the use of two batteries in a three-cell flashlight will cut the light down to about 25% of its normal power and will at the same time reduce the cost of operation (the expenditure of battery energy) to about 55%. The use of a single cell in a two-cell flashlight will cut the light to about 8% of normal and the cost of operation to about 32%.

One method of using two cells in a three-cell flashlight or one cell in a two-cell light is to construct a dummy battery. Take a cylinder of wood 1-21/64" in diameter (or thereabouts) and somewhat less than 2-27/64" long, which is the standard length of a flashlight battery. Fasten a strip of metal, copper if you have it, along the side and over to the center at top and bottom as shown in the drawing at the bottom of page 147.

Carpet tacks at top and bottom will hold the metal and it can be doubled back over the head of the tack to make sure of a good contact. It is most important that the dummy cell or cells be put in at the rear end of the flashlight since the metal strip running along the side of the block will come in contact with the case itself. The jacket from the regular cell can be removed and slipped over the dummy one to provide a measure of insulation.

There is one other method of reducing the candle power and battery consumption of a flashlight. That is to use a lamp for three-cell light in a two-cell case. This will cut the light output to 25% of normal and the battery use to 55%.

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**Only about 30% of the milk produced in this country is sold as fluid milk for drinking and cooking.**

## Skate To Fame

[*Continued from page* 38]

just enough to enable you to throw its weight into the stroke. When you achieve the right body position you'll feel yourself in complete control over your skates.

2. Don't tilt your skates to one side; all four wheels of each skate should be on the ground at all times. To turn, it is necessary only to shift the weight of the body to the side. It is not necessary to raise either inside or outside wheels.

3. There are two forms of starting—for ordinary skating and for racing. Stand with your feet fairly close together. Shift your weight to one foot, say the right, leaning a little to that side. Then strike out with the free, or left, foot, giving first a slight slide and then a strong *backward* push. At the same time throw the weight of your body forward on the right foot. You will glide a short distance on the *right* skate while you hold the *left* skate off the ground and bring it forward in line with the right foot. When the feet are again even, place the left skate on the ground and shift your weight quickly to it. Now repeat the side and backward push with the *right* foot, gliding as before but this time on the left foot.

4. In ordinary skating, for fun, never attempt the running start above mentioned, unless you're in a race; it adds nothing to ordinary pleasure skating, and if you are not experienced you may have a fall.

5. To stop properly, you bring your free foot up as if you were about to make another stroke. But at the moment of transferring your weight to this foot, you turn the other foot out at an angle of 45 degrees and allow the skate to drag behind you with all four wheels firmly on the ground. Be sure of the angle. Too little will not be effective, and too much may trip you if you are going fast. Actually, unless you must stop in a hurry, it is better to coast a short distance with your feet parallel, and then drag one foot. Any other method of stopping will flatten your wheels no matter what material they're made of; also this "four-wheel-brake" system is more efficient.

The easiest way to learn to skate backward is to hold onto a railing while you make your first attempts, until you have acquired a new sense of balance. In either forward or backward skating, don't bend at the waist: take all the bend you need at the knee and instep.

The simpler skating dances are the most popular, especially those which do not require advanced skill. Among the simplest dances are the Straight Waltz, the Barn Dance, and the Two-Step; these dances do not require backward skating, as do virtually all of the others. All dances are done by couples, with the exception of special trio numbers, where three people—two girls and a man, or two men and a girl—participate. Here are the directions for some of the simpler dances, diagrams of which are shown on page 34.

[*Continued on page* 150]

# How To Buy A Used Gun

[*Continued from page* 109]

been classified by ammunition companies as "poor sellers."

Carefully check the action of the gun for excessive wear. There should be a certain amount of play in the fit of some parts, but this can often be overdone. Grease and heavy oil in certain spots cuts down the *apparent* play in parts, but this would have to be removed before use. So clean it thoroughly before you decide to buy.

Whether it be rifle, revolver or shotgun, check for play in various parts. Make certain the gun is empty, cock it, and check the breach mechanism. If uncocked there may be too much play due to design, but there should be very little play with the action cocked for firing.

You hear a lot about that highly technical term "headspace." This really is not complicated. Figures are given in thousandths of an inch. To explain it simply, it means the distance between the face of the breach mechanism when closed, and the face of the cartridge in the chamber. Actually the measurement is taken at a point *inside* the chamber.

To check for excessive headspace is not difficult even without gauges. Take a live cartridge—not a fired shell—and unload it. This is easily and safely done if you place the neck over a hard surface—preferably steel, and tap the neck *lightly* over the bullet while slowly rotating it. It will take many taps, but this expands the brass so the bullet can be picked out with the fingers. Then pour out the powder and you are ready for your test. The cap or primer can do little damage, but you can insert your shell in the rifle and fire it if you want to be doubly safe.

Get a few discarded razor blades or some small pieces of brass shim stock from your garageman. You only need the thicknesses of .0005, .0010 and .0015. Razor blades of standard makes are of uniform thickness. The standard of Gillette types runs .006 and those of the veri-thin types run .004.

To use this material to check for excessive headspace, hold the muzzle of the gun down, insert your dummy case in the chamber, and gradually build up the face of the cartridge case with shims until you can just close the action. Brass shim stock can be easily cut into small disks with ordinary house scissors. Two pair of small pliers are used on razor blades. Hold the blade in one pair and chip to size with the other.

If you can close on the .006 shim, add another. If you can close on two of them, the measurement would indicate at least .012—*dangerous*. DON'T BUY THAT GUN! There is only one way to correct headspace. The factory would remove the barrel, refit the breach threads so it could be screwed into the receiver one full turn—sights must be on top—and then run chambering reamers into the breach by hand to remove enough chamber metal to adjust the headspace where it should be. This is expensive work and the factories can't spare their experts for private work today.

Check your trigger pull. It should be smooth and crisp; neither too light nor too heavy. The ideal trigger pull has a let-off like breaking glass. Never buy a gun with a "mushy" trigger pull—you will not do good shooting with it.

Check the trigger pull for "creeps." This is easy. Rest the gun across the knees after making sure it is empty. Take a good grip and see how slowly and delicately you can pull the trigger until it "lets go." If there are any creeps in the let-off you can feel them. Remember that to cure this fault, a *good* gunsmith must completely dismantle the action and gently stone, try, assemble, dismantle and stone again. The offending parts are delicate. The gunsmith's time costs money.

If the trigger pull is smooth, is it too heavy or too light? This is easily checked. Cock the empty gun and tie a string to the trigger. Tie the other end to weights. There should be no strain and a little slack in the string with the butt resting on the floor. Pick up the gun as gently as possible so the string is on a line with the center of the butt. With care you should be able, on a hunting gun, to pick up a weight of three pounds without tripping the hammer—but never a six-pound weight.

If the pull is less than three pounds it is dangerous and is easily accidentally discharged. Six pounds on the average hunting rifle is too great for good shooting. A box of heavy loads in 12-gauge shot shells will weigh three pounds.

After you have checked the trigger pull, check the hammer or striker in lever and bolt rifles. If of the conventional hammer type, draw the hammer to full cock with the gun empty. Place the ball of the thumb on the spur without touching the trigger. See if you can exert enough push to cause the hammer to fall. If you can, the gun is dangerous. If the gun is a bolt type, follow the same procedure on the striker-end or cocking piece.

If you have a shotgun, close and cock it, then try twisting it, if of the break-open type. Check for play in the breach in this manner; also for wear in the hinge pin. Then break it open and twist again. This will reveal hinge pin wear.

Barrels should be checked carefully. If you have a rifle that can be examined by looking clear through it as a bolt action type, checking is easy. If of the lever type, open the action and insert a white piece of paper in the opened breach at a slight angle to reflect light. Then look through the muzzle with the gun held at an angle to admit light to the piece of paper.

Before you check a barrel to see if it is good, clean it thoroughly. Do not leave oil in it. Oil

[*Continued on page* 150]

# How To Buy A Used Gun

[*Continued from page* 149]

reflects light and can make a rough barrel look highly polished. Never point the barrel at a bright light or against the sun. This admits too much light and does not permit of proper examination. If you check by night, toss a white handkerchief on a table near a shaded lamp and look at the reflected light on the handkerchief.

Do not let anyone tell you that you can "scrub out" pits and rust. Pits are the result of rust, and rust is the oxidation of the steel of the barrel.

A new and perfect full choke gun will put about 70-72% of its charge of pellets into a 30-inch circle at 40 yards, according to manufacturers' standards. What happens to the other 28 to 30%? These pellets, in traveling through a smooth barrel are flattened and "sandpapered" out of shape and fly off to one side—wasted. A rusty, rough or badly pitted full choke can destroy half of the charge in this way—I've seen tests on the subject.

What is worse, a rough shotgun barrel increases the shot string. Take a handful of small pebbles and throw them in a pond. You'll note that they do not all strike the water in the same place but string out slightly. The charge from a shotgun does likewise. Modern ammunition has a shorter string than that of 20 years ago, but from a rough barrel laboratory tests have shown a string as much as seven to ten feet long.

A long string? What of it? At 40 yards it may mean a complete miss in a fast-flying bird. Pellets may pass around that bird—yet it gives a passable pattern on paper. Many birds fly more than 60 miles per hour—which means 88 feet per second—and a hundredth of a second may mean a miss by ten inches.

Why buy your used gun if it shows that it has been abused?

Recently a visitor looked at one of my favorites —a custom-built Springfield that set me back some $200. He thought it was beautiful—but impractical. He wouldn't dare take such a gun into the woods. Why not? That gun was 12 years old. Annually it had been carried countless miles under hunting conditions. It had been used to shoot deer and bear and alligators. Yet it looked like new. That rifle had been used at temperatures ranging from 85° down to 18° below zero. It had been carried in rain, snow, and sleet. Only it had been given proper care. If you are offered a "battle-scarred" gun, why buy it? Its owner didn't give it proper care.

Finally, if you get an "excellent" gun offered to you, what price should you pay? Don't be stuck. If the gun looks like new, 75% of the last published retail price is enough. If it is in just "good" condition, never pay more than half of its original cost. Don't let yourself be just plain "stuck" because some fellow wants to unload a gun he no longer needs. When this war is over, you'll have a gun of little value to trade.

It may be legal to get gypped—but it isn't smart!

# Skate To Fame

[*Continued from page* 148]

## The Straight Waltz

1. Start, say, on the right foot. Take one step, or glide, then take a glide with the other foot, to get speed.

2. After you've gotten your speed, glide with the left foot. Bring up the right foot parallel.

3. Lift your weight off the left foot, then take another glide with it. This is the "shuffle." Then repeat with the right foot.

To turn, change feet without a shuffle.

These steps are taken in three-quarter time, to the waltz music. The two-step is similar except there are no gliding strokes.

## Barn Dance

This is a variation of the Straight Waltz, in technique. When you shuffle on the left foot, you touch your right foot—as you skate along—in front of the left foot, then you swing your leg behind you and touch again behind the left foot. Then reverse. No weight is placed on this "touching" foot. It is just a graceful movement. The music is that of the Argentine Tango.

To master the more advanced and complicated dances requires not only a knowledge of backward skating, turning, and different kinds of strokes, but also it is advisable to know the technical names of each movement. Some terms and symbols used in skate dances are as follows, according to official Association rules:

EDGE: A skate is on an "edge" when it traces a curve. Curves are of two kinds—"Outside (O) and "Inside" (I). A skate is on an outside edge when the center of the curve is to the right of the right foot, or to the left of the left foot. A skate is on an inside edge when the center of the curve is to the left of the right foot, or to the right of the left foot.

THREE is a turn on one foot from a forward edge to an opposite backward edge (or vice versa). The rotation and turn is made in the same direction as the edge.

SPREAD EAGLE TURN is a spread eagle movement using only one foot at a time followed by an outside backward edge.

CHANGE EDGE is the change of edge from outside to inside (or vice versa) on one foot.

SPLITS consist of a forward edge on both feet with the toe wheels of the leading foot raised and the heel wheels of the rear foot raised, the feet being a short distance apart.

CROSS ROLL is a stroke from one edge to a similar edge on the other foot made by crossing one foot over and across the other.

### SYMBOLS

| | | |
|---|---|---|
| R—Right Foot | F—Forward | O—Outside Edge |
| L—Left Foot | B—Backward | I—Inside Edge |
| 3—Three Turn | | X—Cross |

[*Continued on page* 163]

# War Jobs For Modellers

[*Continued from page 47*]

model-builders. You must have knowledge of full-scale aircraft construction and must have built one flying model which has been successfully flown in formal competition. The official age limit is 18 to 25 at present, although the need is so great that that requirement may be waived. Your physical condition must average good.

If you'd like to know all the government wants to tell you about these jobs, and want to take the competitive examination for one of the positions, watch for announcement of exams for Under Aircraft Modelmakers on the bulletin board of the nearest first- or second-class postoffice. After reading the announcement and deciding whether you can meet the qualifications, get a copy of the announcement and the appropriate application form from the local representative of the U. S. Civil Service Commission in the postoffice where you saw the notice, or write to the manager of the civil service district in which the examination is announced.

The examination, as each announcement will say, is an unassembled one—requiring no written competitive test. Competitors are rated on the extent of their education and experience relevant to the duties of the position, as shown in their application. If you qualify, your name will be placed on an eligibility list from which appointments are made as the Government's needs require.

If you get the job, you'll find yourself making models along different procedures than probably you've ever worked before. That's because the government's aerodynamic testing equipment for miniature planes is so new that few modellers have the variety of experience to be able to make models for the tests right at first. The models needed are greatly varied in character—from the kind where weight is disregarded but surface dimensions are highly accurate, to the type where weight is exactly proportional to the size of the model.

If you happen to get one of these jobs, you'll be called on to build models of widely varied shapes and sizes—perhaps you'll even be building the model flying boat hulls. If so, you'll probably get a chance to see them towed by a trolley for a half mile in the model testing tank.

One of the most interesting types of models turned out is the type used in the "spin chamber." This chamber is like a huge cylindrical tube standing on end. A powerful suction fan runs at the top and another one blows air up from the bottom. The model, which is made from hard balsa, is suspended on this powerful air current—literally hanging in mid-air. Its rudder is set to produce a tailspin as the test begins. Then when the "pilot," who operates the rudder by means of a remote electrical control, flips the button, the rudder swings to the position that should end the spin. If the model continues to spin, it has to go back to the laboratory for more work until the recovery is satisfactory.

The free flight tunnel is somewhat similar in that the model actually lifts itself in the tunnel's air stream. Electrical control wires leading out of the model carry current to the solenoids that operate the control panels and also to the light weight electric motor that turns the prop. The "pilot" on this job has more to do, operating all the controls. In all these tests the planes' actions are recorded by a movie camera.

Every model builder who qualifies himself during the many phases of this training can be pretty sure of a job specializing in some branch of the work done at the field after the training is completed. And his pay increases with his experience and his ability to handle the problems that confront him.

# War In Paradise

[*Continued from page 52*]

prized for carving figures and canoes. The choicest white native cloth is made from the supple underbark of the young branches of the tree.

In sixteen years of sailing among the South Sea Islands, never before have I seen such great patches of *taro*, yams, *manioca*, and sweet potatoes being cultivated. *Manioca* is easily cultivated in Polynesia and requires but little care. It bears large dark crimson flowers and its roots can be either baked and eaten as vegetables or used for making starch. Tapioca can also be made from the starch by drying it with heat. *Taro*, which the natives have called "king of roots," bears a solid tuberous root about a foot long and eight inches in diameter which, when cooked, is one of the most nutritious and wholesome of island foods. Bright yellow flowers indicate when it is fully grown. The flowers and stems may be eaten and the young *taro* leaves are excellent when cooked and eaten like spinach, called by the natives, *pota*. Another excellent sort of spinach is made by taking the young tips of sweet potatoes and boiling and mixing them with cocoanut milk.

Since there are no foreign spirits left, orange and pineapple beer and sugar cane rum and cocoanut toddy moonshine have come back into their own. From the budding sheath containing the young cocoanut flowers cocoanut toddy is obtained by tying the end of the tiny nut, cutting off the tip and placing a funnel and gourd to catch the juice. Four buds may be tapped on each tree and each will daily produce a pint which when allowed to ferment produces a potent cocoanut toddy.

Because of the great exodus of Americans and Europeans anxious to get home after the outbreak of war, rents are now unusually low. We were offered a four-room house, completely

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# War In Paradise

[*Continued from page* 151]

furnished for six dollars a month. Coffee sells for 5c a pound; tobacco 9c a pound; beer 9c a quart; rum 50c a quart; filet steaks 15c a pound, and choice fish that would make the reputation of a New York restaurant are free for the taking from lagoons that are also full of lobsters, crabs, oysters and shrimps.

Since many of the island's best young men volunteered to "see the land of the *popaas* (whites) across the sea" and were taken South on New Zealand freighters, there are a large number of lonely young girls left on the island. Many of them will cook, wash, and do housekeeping for $3 monthly. However, if single and she likes you she will do it for nothing.

Many of the best plantations on the island are for sale for a few hundred dollars. Plantations that are owned by American or European former residents. Many formerly-prosperous traders and planters now without markets or a means of shipping their copra vanilla or pearl shell to the outside world, have swollen the ranks of the beachcombers. If missionaries are needed today in the South Seas, they are needed to help white beachcombers and tropical derelicts rather than the natives. Young Teroni, an intelligent native boy from the island of Bora Bora, asked me "Why don't the *popaa* (white) missionaries go to help the poor angry people of your country so that they stop fighting each other and live in peace as we do here in Tahiti?"

Just a week before I left Papeete, the owner offered to sell me what was once the finest copra plantation in the Marquesas for a song. "Just the place for one of you writer fellows" he said, "a whole valley to yourself coming right down to the sea with your own waterfalls and mountain streams. Since copra's finished, I don't even bother to gather the cocoanuts anymore."

The Tahitians are the most gentle, kind, and lovable people I have met anywhere in the world. Instinctively they give much and take little. A fine example is old Chief Mauu who lives out at Papeari at the opposite end of the island, about thirty miles from Papeete. Known far and wide as the grand old man of Tahiti, he is the very finest of fellows and one of the few remaining pure Tahitians on the island, a direct descendant of the great chiefs of old. "*Aue!* it is good that we have not forgotten the old ways," Mauu said at dinner one evening and smiled as he added, "it is good, too, that a chief is a chief and a man is a man again."

On our last night in Tahiti, the night before we sailed north for Honolulu, we were guests at a big farewell dinner that lasted way into the early "hours when the first cock crows." Great quantities of *taro* and *fei* were cooked and huge prickly-rinded breadfruit baked. Frails of oranges and yellow banana bunches hung beside huge baskets of mellow custard apples, delicious ripe mangoes, and mountain watermelons and stalks of sugar cane. The boys brought baskets of shell-fish and long strings of lobsters and crabs. Teroni's canoe came in heavily laden with fat *bonito* caught on shiny pearl-shell hooks. Smaller fish were speared out on the foaming reef after dark, by the light of cocoanut husk torches, while the pigs were being roasted *hima*-style in deep pits of hot stones.

Everyone played an instrument of some kind. Some strummed on homemade guitars and ukeleles, others blew mouth organs, and others whammed out a weird tom-tom on drums made out of sharkskin stretched across sections of hollowed barringtonian tree trunks. The most popular tune of all was a South Sea rendition of "Happy Days Are Here Again." When my turn came I offered a remembered version of Beer Barrel Polka. It immediately was a great success.

Yes, the war gods have set the clock back in Polynesia and as a result the Tahitians have grown healthier and happier. Climbing the mountains for *fei* (wild bananas), daily fishing at sea, basking in the sun, and swimming in the lagoons preserve their health and primitive vigor. If the war continues for many years and still ships do not come, the food, the dances, the amber-skinned beauties, cocoanut-thatch houses, and great carved canoes once again will be what they were when Melville, Stevenson, and Jack London called there.

# Beralite Will Bomb Berlin

[*Continued from page* 61]

be used, at present, on the parts of a plane where it can offer the greatest advantages.

Then, as production facilities are increased and converted, entire airplanes can be built of it. While Cooper perfected the metallurgical advances necessary to turn out large quantities of Beralite, E. Burke Wilford worked seven days a week to prepare the way for its immediate applications to aircraft and to break down opposition to this ideal metal for aircraft construction.

Now that the alloy itself is ready, the details of its application have likewise been carefully worked out in advance. Skin panels of the fuselage, control surfaces, and the top skin of the wings are the parts of the plane proper that are first in line for Beralite. Pistons and valve push-rods are the engine parts slated for manufacture in the new alloy, with all reciprocating parts receiving consideration.

Without even changing its shape, the airplane is set for a revolutionary advance. Based on estimates of Martin, North American, and Douglas, the increase in the useful load of aircraft made of Beralite will range from 35% to 50%. That's not bad—for an alloy that "couldn't be made—and would not have any aircraft use if made—" just nine months ago.

# Hi-Fi Audio Amplifier

[*Continued from page 116*]

hum from the wiring, etc. The plates are tied together, of course, while the grids get independent feeds. One grid is fed from the output of the mike pre-amp; the other from the phono pick-up, the mixing potentiometers are in the grid circuits.

*Electronic Tone Control:* The 6C8G was chosen for this stage for much the same reasons as above. Since we want independent control over the bass and over the treble separately without interaction it is necessary to have essentially separate tubes for each. With the set-up provided we can boost *or* cut *either* the bass or treble from normal without affecting the other in any way. The tone correction is accomplished by the use of condensers and resistors solely without the use of any chokes, which have a tendency to pick up hum. Separate cathode resistors and by-pass condensers are used to eliminate the last vestiges of interaction between the two controls. In the mixer stage the advantage to be gained by this arrangement would be much too small to be worth the extra cost, whereas in this stage it was found to be worthwhile.

In the bass channel a large coupling condenser is used from the previous stage. This, of course, allows all frequencies, highs and lows, to get to the control. The bass control is a 500M potentiometer by-passed by a .05mfd condenser which tends to by-pass the higher frequencies since the reactance of a condenser is inversely proportional to the applied frequency. The grid of the bass section of the 6C8G is fed from the moving arm of this control. It thus receives a signal emphasizing bass.

In the treble channel a small size of coupling condenser is used between the tone control stage and the mixer stage. This condenser has a higher impedance to the lower frequency waves. The lows therefore just do not get through to the treble section of the 6C8G. The control is a similar pot. but this time it is not by-passed. This section thus receives a signal emphasizing treble.

The values of these condensers have been chosen in both channels such that the mid-point of each of the two controls represents normal. In other words: when the two tone controls are set at their mid-points we have a flat response just as though no provision for tone control were made. We can therefore either boost the highs or the lows or both or cut either. This great flexibility is very desirable in matching up to various mikes, cutters, pickups, loudspeakers and studios. It also permits the listener to please his own taste. Many people like to listen with the lows boosted.

It will be noted that a de-coupling resistor is provided in series with the bass coupling condenser. The purpose of this resistor is to prevent by-passing all the highs by the .05 by-pass across the bass control. If it were not provided—there would be no highs at all available at the mixer plate for use by the treble channel. It's value is also quite critical and will affect the fidelity of the amplifier as a whole if it is not correct.

*Phase Inverter:* The 6SC7 tube is an ideal phase inverter tube because it is a dual triode having a common cathode; eliminating the necessity for the grid cap (there are only eight prongs in the base of the tube). The 6SC7 has less gain than the 6C8G. High gain is not desired in a phase inverter. The 6SC7 also has low distortion with larger inputs. The gain of this stage being about 20 we tap the input for the phase inverter grid at about 1/20th of the way up on the grid resistor of the upper 6L6G. (Note $R_3$=5000 and $R_9$=100,000 ohms.)

*Inverse Feedback:* The phase inverted feedback is fed into the straight amplifier section of this tube through a one megohm resistor. The one meg resistor carrying the feedback is tapped in to the grid resistor of this section of the 6SC7 about 10% of the way up ($R_1$=50,000 ohms; $R_4$=500,000 ohms). The feed is obtained from the 500 ohm secondary winding of the output transformer. Inverse feed back can be omitted with relatively little noticeable loss in fidelity if an output transformer is used which has no 500 ohm winding.

*Push Pull Output Stage:* 6L6G's (6V6G's can be substituted) were chosen because of their power output capabilities at low driving power. They are operated at Class AB with full output. Of course, for small inputs the Class A conditions prevail with both plus and minus grid swings falling entirely within the straight line portions of the tube $E_c$ $I_p$ characteristic curves. Due to the high sensitivity of the 6L6G's (or 6V6G's, if used) it was possible to use relatively low values of plate load resistors in the previous stages which, combined with high values of grid resistors, result in improving the fidelity in the "highs" range. The output is via a suitable transformer as specified in the parts list. It will be noted that a transformer was chosen which provided a number of output impedance taps which are very convenient. Any available output transformer can be substituted as long as it matches tubes and speaker you will use. [Catalogues usually

[*Continued on page 154*]

**THE JAPS SAY. . .**

***"If we wish to gain control over China, we must first crush the United States."***—**Baron Giichi Tanaka, former Jap Premier.**

**AMERICANS SAY . . .**

**. . . you can't crush a country that is willing to spend and spend and spend to prevent being crushed. Buy more War Bonds and Stamps NOW!**

# Hi-Fi Audio Amplifier

[*Continued from page 153*]

list transformers according to output tubes used.]

*Tools Required:* The tools required for the construction job may be divided into three classifications, namely: Tools for drilling and punching chassis, tools for assembly and tools for wiring. They are very simple tools found in the average home constructor's workshop and are the minimum essentials for any other job of this type and therefore well worth acquiring. List follows:

Small "egg-beater" type hand drill with the following twist drills: No. 28 for 6-32 screws, No. 16 for 8-32 screws and ¼" for drilling pilot holes for the reamer; a ½" tapered hand reamer, a 1⅛" socket hole punch either of the Amphenol hammer drive type or of the Greenlee screw-type (an additional 1½" reamer can be used instead of the socket punch); center punch and hammer; red crayon pencil.

Medium sized long-bladed radio type screw driver; a 5/16" socket wrench for 6-32 and 8-32 nuts (or a medium sized pair of side cutting pliers).

Electric soldering iron of 75 or 100 watts with small spade tip; a pair of long-nosed pliers about 6" long; a pair of diagonal cutters also about 6"; medium emery cloth; rosin core solder.

*Drilling and Punching Chassis:* Using the sketch provided with this article lay out on the chassis, in red pencil, a drawing showing the proper location of the centers of all holes to be drilled. Start drilling (after centerpunching a mark at each location of a hole) all holes with the No. 28 drill. Now drill out the mounting holes for the heavier components, as indicated in the drawing, with the No. 16 drill. Next, the pilot holes for all the larger round holes with the ¼" drill. Ream out to the proper size with the hand reamer. The socket holes may now be punched out. The socket punch requires a ⅜" hole to be drilled before we can use it. The holes for the controls remain ⅜" as indicated and do not need to be punched further. The pilot light requires a 7/16" hole and the switch requires a ½" hole. These must be reamed to size. The mike jack requires a ⅜" reamed hole. The holes for passing through the transformer leads are all reamed to ½". The final location of all holes is not shown in the drawing accompanying this article to permit the constructor to use any parts available, although the parts specified are highly recommended. It will be necessary for the constructor, therefore, to use his own judgment in this direction. The centers of all parts are shown so as to establish definitely the location and layout of the components.

*Assembling the Parts:* The sockets are the first things to be mounted. Note that the direction in which the pin or keyway of the socket faces is indicated in the drawing. It is important that these be placed in the proper direction as this will make for shorter leads in the wiring. Use 6-32 screws 3/16" long with 5/16" nuts and use lock washers directly under the nut. Lock washers are important.

The output and the phono connection strips are the next to be mounted, using the same type screws and the same precaution concerning lock washers.

Now mount the power transformer, output transformer, filter choke and filter condenser using 8-32 screws 3/16" long and 5/16" nuts and suitable lock washers as before. Be sure to face the axes of the cores of the various transformers as shown in the sketch to avoid hum pick-up; this is important. It is desirable to place grommets in the holes through which leads are to go before mounting the transformers. Grommets will protect the leads from damage by abrasion.

Next mount the two cardboard case de-coupling filter condensers under the chassis using 6-32 screws as with the sockets. The two bleeder resistors should now be mounted followed by the various controls,

*In next month's issue*

"I FILMED THE WORLD AT WAR!"

by TED GENOCK, ace cameraman for Paramount News

Newscameraist Genock had to be on the alert every hour of the day

Just back in the U. S. after many harrowing months on the warfronts of the whole world, Ted Genock tells how it feels to be taking movies under fire, during a bombing raid when protecting fighter planes failed to show up, how he had to fight Africa's persistent sand . . .

Just one of the many *action-filled* articles in the big October issue of

MECHANIX ILLUSTRATED 10c

the pilot light and the on-off switch. Be sure to face the controls as shown on the drawing. This is important if you are to avoid hum pick-up and oscillation. Note the order in which they are mounted.

*Wiring the Amplifier:* The greatest convenience and neatness in wiring will result if the builder follows the sequence we have indicated here. This plan is the result of long experience in commercial wiring where results and time are of equal importance.

Begin wiring by connecting the leads from the various transformers to their proper places. (This clears away all the heavy transformer leads which otherwise get in the way.) That is to say, connect the leads from the output transformer to the output strip, etc., etc., following the wiring schematic diagram. Be sure to run the wires in such direction as to keep them *away* from the high sensitivity end of the amplifier which is the right front (when viewing the completed unit from the front). This will avoid hum pick-up and feedback which may cause oscillation.

Now wire in the heaters twisting the wires together as you go. From the transformer first run to the pilot light, next to front 6L6G keeping the leads away from the front of the chassis, next to the rear 6L6G, next to 6SC7, from there to 6SF5, now to 6C8. From the 6SC7 we tap off heater leads to the 6C8 tone control tube.

Now run the high gain ground leads, those of the (6SF5 stage and the two 6C8G stages). Run an insulated wire from the shell contact of the 6SF5 to the mike socket. From the 6SF5 shell contact to the shell of the 6C8G mixer and then continue the lead to the shell of the other 6C8G. From the shell of the 6C8G mixer run a lead to the ground lug of each of the four controls. The ground lug in each case is the one in the most counterclockwise direction as we face the rear of the control. The schematic diagram shows that these grounds are common. It is important to use insulated wire to avoid "ground loops" which pick up hum.

Now run the shielded grid wires, starting at the mike stage, putting in wires and condensers as shown in the circuit diagram. In the high gain early low level stages the grounding of all resistors and condensers must be brought to the common stage ground and not to the chassis. The shielded leads will be recognized on the diagram because they are shown with a dotted line on either side of the lead.

The remaining wiring is not critical and the builder can suit his own convenience. Remember the cardinal principle of short direct leads rather than fancy and long right angle turn wiring. Every lead is a potential source of hum pick-up and feedback. Use as little wire as possible—use only the pigtails provided on the resistors and condensers and cut these as short as is suitable.

For greater convenience in supporting the resistors it is common practice to use terminal strips. We found it convenient to use one four-terminal strip and two two-terminal strips. The four-terminal strip was soldered to the chassis in the center of the square formed by the 6SF5, the two 6C8G's and the 6SC7. One of the two two-terminal strips is mounted under the front support screw of the rear 6L6G; the other was mounted by soldering to the chassis directly behind the 6SC7 socket.

*Miscellaneous Hints:* Choose shielded wire having a large diameter and having much insulation separating the wire from its shield. This reduces the capacitance of the lead and is very desirable to help conserve the high notes in the amplifier.

Use rosin core solder and be sure to keep the tip of your soldering iron clean and tinned. To prepare an iron, first file the tip clean while cold. Plug in, and as soon as the iron is barely hot enough to melt the solder, apply the latter (rosin-core) to it. By tinning at this low temperature we avoid oxidizing the iron. During the wiring operation wipe the tip with a clean cloth occasionally.

Keep the exposed part of the wire sticking out of the shielded leads as short as practical. This will reduce hum and feedback. The shields over the 6C8G's are very important and must be supplied to prevent hum pick-up and oscillation. In mounting the Goat type metal tube shields, be sure to scrape the chassis at the two screw-mounts which hold the lower part of the shield and hold the tube socket as well. This will insure a good ground. The same screws hold both the socket and shield base.

The AC wiring must be twisted pairs; this includes the high voltage, heater and 120 volt wiring. The wiring to the switch should also be twisted.

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"Sure it's a swell idea, but where's all the ducks?"

## The Airplane Of Tomorrow

[*Continued from page* 45]

Development has also been much greater than the general public knows in the field of the "rotary air foil," as applied, for example, to the type of plane known as a helicopter. From an aeronautical oddity, this variety of machine is fast approaching the practical stage, and its potential superiority to the present airplane is so obvious that it is likely, in the long run, to displace the present aircraft.

The helicopter uses rotary wings in the form of one or more rotating horizontal propellers. (The writer has himself obtained remarkable results in recent experiments along these lines.) Lift is provided by the rotation of these wings or blades while the machine itself hovers without moving at any given altitude. The plane can therefore move vertically, horizontally, backward—in short, with complete independence of presentday landing facilities. Moreover, its efficiency is several times greater than that of the present airplane.

Ultimately, of course, the horizontal propellers will go the way of the vertical propellers, as reactive-propulsion machines make all such adjuncts obsolete. It is not difficult to conceive reactive force from a rocket engine equal to the weight of the machine, thus holding the machine stationary in the air. Increasing the force of explosion, the plane can be made to move in a direction away from the explosion. Three such jets of power acting along three axes would enable a plane to travel in any direction or remain suspended in space. Freed from dependence on the atmosphere for lift, these rocket planes will be able to explore the universe beyond the stratosphere and the gravitation of the earth, visiting other members of the planetary family.

Such concepts are not new. They are familiar to all who have dabbed in the theoretical and

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"I've been doing a lot of trick photography lately, Doc . . . —then suddenly this happens!"

## Hi-Fi Audio Amplifier

[*Continued from page* 155]

A two-terminal mounting strip is mounted under the screw holding the rear of the bleeder resistor. It is near the hole through which the line cord is brought into the chassis and serves as a tie point to secure the line cord. The line cord should also be knotted inside the chassis so as to avoid a tug on the line from "uprooting" any parts inside the set.

Run the mike lead from the mike jack *direct* to the grid of the 6SF5. This will reduce hum pick-up by this lead.

## Leon And Ickle

[*Continued from page* 123]

chassis. This is actuated by a V-belt from a 4" pulley mounted on the steering shaft, a horizontal rod running through two wooden uprights, with the steering wheel at the back end.

Jopling's car is self-starting, having the standard washing machine foot-crank pedal. The wheels are 10" pneumatic scooter wheels, carrying 10 lb. air pressure. The two-speed gear arrangement was made desirable by the fact that the engine is not equipped with a speed control, as Smith's engine is. Jopling's car was probably simpler to build, though he confesses he'd be in bad shape if the supply of fan belts gave out.

The tools required to build Jopling's wooden job were: screw driver, brace and bit, ¾" auger bit, 2" adjustable bit, hand saw, hack saw, electric drill, several drill bits, files, adjustable end wrench, and T-square. The complete list of parts is:

1—¾ h.p. engine or to suit
4—10" pneumatic scooter wheels
1—¾"x36" line shaft
1—½"x36" line shaft
2—¾" shaft collars
4—½" shaft collars
½" V-belts, as required
2—6½" pulleys
1—5" pulley
2—8" pulley
5—4" pulley
1—2¾" pulley
36 feet of pine, ¾"x3¾"
2 feet of pine, 2"x8"
2—¾" or ½" bronze bearings
2—10" strap hinges
2—skate wheels
2—½" machine bolts
1—steering arm
1—Model T steering wheel
2—½"x4" coil springs
2—brake rods
2—½" pipe 4"
4—½" self-centering, shaft hangers

Plain ordinary water is now being used successfully as a lubricant for bearings in giant steel mill rolls and large ship propeller shafts through advances in the plastics industry. Woven textile fabrics are impregnated with an organic binder and then treated by temperature and pressure to create these bearings, which require no oil or grease but perform efficiently when lubricated with water, which serves both as a cooling agent and as a lubricant.

Presented to the U. S. Army by the U. S. Antarctic Expedition, 37 husky dogs are being trained in New Hampshire for sled service in Newfoundland.

# A Sixth Front Against Nazis

[*Continued from page 57*]

It is important to fix in your mind this picture of Europe as one vast, walled fortress.

On that Russian side, the garrison of the fortress is engaged in a huge sally in force against the only army that has so far withstood the might of the Wehrmacht. The task of the other United Nations is to so disperse Axis strength as to permit the Russian forces to take the offensive all along their line.

The strategy of successful action against an enemy possessing interior lines is to force him to the greatest dispersion throughout the length of his perimeter. Normally this would mean an enormous preponderance of force on the part of the attacker. Actually the attacker's forces can be multiplied by the increased mobility provided by naval and air forces—footwork can make up for lack of weight in other words. Above all, the problem will not be solved by a "second front." The object of a second front being to disperse the German forces—why only a second front? Why not a third, fourth, fifth, and sixth fronts to gain the maximum of dispersion?

The problem is actually an attack against a fortified continent, a siege in other words. Once it is looked upon as a siege operation it immediately becomes simplified. Until it is solved by the principles governing siege operations all other efforts will be wasteful of time and human lives.

In laying siege to a fortified place, the besieger follows certain principles. He first sees to the total blockade of the besieged, keeping food and munitions from them. This has already been done about as effectually as circumstances permit.

Next he establishes lines of contravallation, counter walls, to pen the enemy in and keep him from making sallies in force, with danger of routing the besieging forces.

These lines of contravallation in the present instance already exist, in part, for the very moats that protect European fortified coastlines also act as deterrent to sudden Axis sallies except at very few points, such as across the narrow width of the English Channel, the narrow waters between Sicily and Africa; the narrow waters of the Dardanelles; the strait of Kerch; or by island steppingstones across the Aegean Sea to attack Syria.

Recent months' developments in the Mediterranean theatre have made the map of this area familiar to us all.

There exists always the danger that the besieged enemy will break through at any one or two of these points, and heavy concentrations of troops and air power in Great Britain, in Africa, at Malta, in the Near East and in the Caucasus are maintained to prevent such sallies. The Rommel Egyptian campaign is such a sally.

With his lines of contravallation established, the besieger looks next at his strong points, his bases for siege machinery and ordnance. In the old days he set up catapults. Today the short range fighter plane and the bomber are modern versions of the ancient ballistiae and catapult, able to project their missiles at immensely increased distances with more accuracy.

Bomber bases are possessed in plenty by the besieger. It is in bases for the deadly short range fighter plane that the United Nations are weak. Those bases will have to be seized, preferably islands and peninsulas, extending around from Norway to the Aegean, with enough of them seized, as Crete was seized, to ensure maximum dispersion of the enemy air power and land forces. The seizure of these bases for short range fighter planes is most important.

But the besieger should not be content with external dispersive tactics alone, especially if he is fighting against a besieged enemy who is holding down large groups of subject people. The crafty besieger against an ancient city fomented uprisings, arson, riots and sabotage within the city, timing the maximum of these to occur at the climax of his own attack.

The numerous millions of bitter and vengeful people of the occupied nations in Europe, their efforts strengthened and coordinated by being supplied with short range radios, demolition materials and weapons, will furnish powerful internal support to an external attack. The present hit and run tactics of the commando forces could be made more valuable by leaving behind them such radio sets, demolition materials and weapons on each foray. Bombing attacks, effective as they are, could be made of more value by diversions of strong air commando forces, hitting, landing, leaving supplies for secret groups and departing before the enemy could concentrate in force against them.

With these measures taken, preparations would be well advanced for the final attacks.

These should be preceded by much propaganda, with rumors of landings everywhere except the landing places which actually are to be used, to secure diversion of enemy strength before the real blows are struck.

Those blows, struck at time of maximum, all-out offensive action by the Russian Army, should hit at Norway, at Southern France, at Italy and at the Balkans simultaneously. They should in all cases be preceded by heavy parachute attacks, followed by the quick landing of air borne infantry and tanks, to take land defenses in rear, while sea and air borne troops, landed from gliders and barges, followed up in force.

With perfect timing, absolute unity of command, proper coordination of maximum internal and external dispersion on every front and accent upon air power, the attack on Berlin could become a possibility not next year but this year. Accent upon air power is the key.

# Compound Microscope

[*Continued from page 117*]

tered exactly below stage opening, as shown.

The objective and eye lenses are mounted in a tube that slides inside another tube or sleeve fastened to the stand. A convenient way of making the longer, sliding tube is to cut strips of heavy paper 6" wide, coat them with glue, and roll them around a wooden or metal form that has been covered with a layer of wax paper to keep the glue from sticking to the form. Six or eight layers will give sufficient stiffness. The finished tube should be 6" long and ⅞" inside diameter. Use black paper for the tube lining or paint the inside with black India ink to prevent reflections from the walls.

When the glue used in making the first tube is dry wrap around it a single layer of felt or velvet cloth about 2½" wide and over this apply several layers of heavy paper bound with glue. This forms a sleeve in which the longer tube will slide with ease but at the same time will remain in any position. Attach the sleeve to the upper end of the stand upright, which has been hollowed out to receive it, with glue. Distance from the lower end of the sleeve to the top of the crowfoot forming the base is about 3". Distance from the sleeve to stage top is 1¼".

There remains the 1-inch-square substage mirror, which is supported by a bracket projecting from a hole drilled at least 1¼" below the bottom surface of the stage. A rectangular piece of sheet metal with the ends bent over, forms a backing for the mirror. To this metal piece is soldered a lug that enters a saw slot in the end of a brass rod. A small nail passing through a hole drilled in the rod and lug forms a pivot permitting adjustment of the mirror angle. Further adjustment is obtained by rotating the rod in the hole in the upright. Center of the mirror should be in line with the lens tube axis. In the model shown, this is 1⅛".

The objective lens, if made of a water drop or glass bead, is supported by a small metal disk cemented to the end of a wooden plug fashioned from an ordinary spool or made from any other piece of wood. Outside diameter of the spool is such that it will fit snugly inside the lower end of the paper tube. A strip of cardboard glued inside the tube forms a shoulder against which the wooden lens mount rests. Coat all inside surfaces with black ink.

It is fun to experiment with a water drop lens, which is much easier to form than a glass-bead type. Drill or punch a small hole in a disk of copper ⅜" in diameter and fasten the disk over the end of the wood nosepiece with glue or cellulose cement. To form a lens dip a toothpick in water and transfer a small drop to the hole. If the drop wants to spread beyond the hole edges, apply a film of grease to the disk surface. Carefully insert the nosepiece into the lower end of the tube, and with the eyepiece in place your microscope is ready to use for varied experiments.

For a more permanent lens you can use a glass bead. Make a disk of sheet steel or copper as for the water lens and clamp it between the jaws of an old pair of pliers. With an acetylene torch, blowtorch, bunsen burner, or blowpipe flame, heat a piece of glass tubing until it becomes soft. Then pull it apart to produce a long, slender thread of glass. Heat one end of this glass thread until it melts into a bead. When the bead is of a size that will just prevent its passing through the hole drilled in the metal disk, remove it from the flame and let it cool. Separate the bead from the glass thread and lay it over the hole. Heat the disk until the glass bead softens and finally assumes the form of a tiny sphere, perhaps somewhat flattened where it rests on the edge of the hole. Usually the glass bead will remain firmly in place in the hole after it cools.

Do not expect to obtain a perfect lens the first time. Over-heating, cracking, or simply failure of the glass to assume the correct shape may cause disappointment. But keep trying until you obtain a lens that will give a clear image. Of course you cannot expect such a lens to be as satisfactory as that of a high-priced microscope: but such simple glass beads can be surprisingly efficient at times. The magnification with a 10-times eyepiece may be as high as 500 diameters, depending on the size and form of the glass bead.

As for the eyepiece, the specifications given for the paper tube are such that it will accommodate a standard microscope ocular measuring about ⅞" outside diameter. However, a much cheaper but slightly more cumbersome arrangement is to mount the lens from a tripod magnifier on top of the tube. Such a magnifier makes a surprisingly efficient ocular. The paper tube is inserted into the lower side of the lens mounting, any extra space being filled with felt or paper strips glued to the tube.

In making the objectives try various sized holes and various sized chunks of glass. It may be necessary to shorten the lens tube an inch or so in order to make the objective and eyepiece system work well.

To use the microscope, adjust the tube roughly by sliding it up or down inside the felt-lined collar. Then use the fine-adjustment screw to raise or lower the stage slightly.

You can use this microscope as the basis for a more advanced outfit. First play around with water-drop and glass-bead lenses, and then when you have proved to yourself that microscopy is one of the most fascinating of hobbies, you can purchase a 40-mm. or 16-mm. objective and a 5- or 10-times eyepiece for a few dollars, and mount them in the paper tube. Later you can purchase a standard microscope stand on which these lenses can be used.

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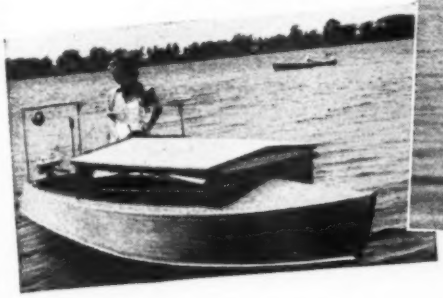

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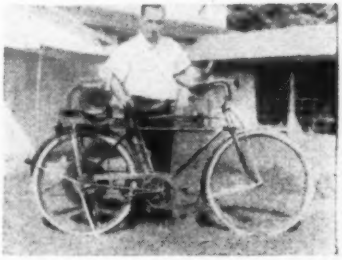

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# Broomstick Bass Plugs

[Continued from page 119]

(Fig. 4). Tighten the screws into the body of the plug as much as possible, being careful not to chip the paint.

Should you desire to add a more life-like appearance to the "Yellow Killer," you can very easily accomplish this by painting eyes on both sides of the head. First dab on a small solid circle of jet black paint, then a smaller dot of white on top of the black, and then still a smaller dot of black on top of the white (Fig. 5). If you should desire the eyes to stand out from the head of the lure, in sort of a goggle fashion, first insert small round-headed screws, or nails, then paint the eyes over these.

The amateur plug maker does not need to limit his color scheme merely to the yellow advocated for the "Yellow Killer." In fact, I would suggest that you devise several other color schemes and combinations of colors. These can be experimented with in order to determine the pattern best suited for any particular area. Don't fail to try out even your most fantastic and crudely made creations, for they may prove very effective.

Plugs are frequently attractive, to both small as well as large-mouth bass, when painted with a pure white body and a scarlet head about 1" wide, or a yellow body with a scarlet head (Fig. 6). Don't attempt to paint the heads on with a brush, for an easier and better method is to merely dip the head of the plug into the can of scarlet paint.

Solid black plugs have often proved to be excellent, especially at night when the dark body of the lure will stand out against the sky overhead. And plugs coated with a luminous phosphorescent paint are also fine for night fishing. These luminous baits have two specific advantages, one being that after they have been cast their position can be easily located by the angler. And secondly, the attractive luminous glow will frequently arouse the curiosity of a bass some distance away from where the plug has been cast.

There is little need for the amateur plug maker to expect poor fishing results simply because his first few attempts seem rough and unsightly. Some of the most crudely made lures will very often prove more effective than those made with skilled perfection. Consequently, when the little complications crop up, as they doubtlessly will from time to time, remember that even the beautifully made factory baits are the descendants of drab, fantastic looking, and poorly made creations more often than not.

To be sure, black bass are a highly temperamental and uncertain game fish. And few authorities have been able to explain much of their strange habits and feeding activities. I have witnessed an angler casting plugs of every description, but to no avail. Then in his disgust, irately throw a cigar butt into the water only to have a big bass strike at it savagely. And I have witnessed two anglers, fishing with identical tackle and baits, and one angler would be consistently getting explosive strikes whereas the other would not receive even a half-hearted swirl for his troubles. This situation prevailed even though both anglers took turns at fishing. Perhaps just a small portion of paint, chipped from the body of the plug used by the successful angler, imbued it with some incredible allure which could not be explained.

One point which might be of some interest, is that almost any plug model can be constructed in two sizes. One size, which is probably the most popular, is 3" in length having two treble hooks; one hook being located on the belly of the plug approximately 1" from the head, and the other hook located on the tail end. The second, and larger of the two plugs, is 3¾" long with three treble hooks; a hook on the belly 1" from the head; a hook on the belly 2¾" from the head, and the third on the tail (Figs. 7 and 8).

The basic body construction principles, of both the 3" and the 3¾" plugs, are the same in that the tail ends are tapered to ¼" in diameter. In this tapering procedure follow the instructions given for the "Yellow Killer." However, for models having other than the cigar shaped head I would advise that the tapering be started about 1" in front of the tail end on the 3" plugs, and 1¼" in front of the tail end of 3¾" plugs. Thus a balanced body will result. Do not, however, taper the tails in a direct degree. Round them out proportionately.

There is one very popular head design which I think is deserving of mention. This is the combination floating and diving type having a slanted hollow nose (Fig. 9).

Anglers addicted to the fine art of plug casting invariably report this one of the most successful lures. Be sure to make it.

"I can't understand it—not a single attempt to steal my new rifle sight."

# The Airplane Of Tomorrow

[*Continued from page 156*]

imaginative reaches of flying. The point I want to make, however, is that these concepts are no longer in the domain of pure fancy. They have already found practical application and their further development must be regarded as a matter of sober engineering progress, wholly within the limits of practical mechanics.

This is pre-eminently a technological war. Since the skies have become the first and decisive sphere of combat, technological ingenuity may be expected to find its greatest expression in aeronautics. *Every belligerent nation is fully aware that the entire balance of fighting forces may be upset at one blow by the emergence of a single invention. The whole inventory and production of the enemy may be cancelled out by some device which expands the performance of airplanes to a degree which obsoletes all existing aircraft.*

It is no secret that we in America, like the Germans and the Russians and the British, are perfecting fuels and engines, metal alloys and instruments, which may revolutionize aviation. Some new alloy may be produced for airplanes, so light that the weight factor will be sharply reduced, with consequent enhancement of performance. (Editor's Note: See "Beralite Will Bomb Berlin, page 58) An improved fuel—or a more efficient engine—might overnight double the range and the other qualitative elements of some nation's aviation to the point where its superiority would become decisive. Precisely because the threat of such intellectual surprises hangs over the heads of all warring countries, research is speeded up, inventive thinking is sharpened, the practical application of theoretical knowledge is stimulated.

All of which, in turn, means immeasurable progress for the aeronautical sciences. The impulse comes from war, but the final exploitation will come in the era of peace. Every element developed for purposes of destruction lends itself to application, no less, to purposes of commerce and culture. The radio instruments which now figure in fighting will undoubtedly figure in the future as safety devices. The new speeds and ranges will in the future offer to mankind cheap and rapid means of transport that will turn the planet into a neighborly area accessible in any direction, including flight across the two poles.

America created the airplane. Because we are at bottom a pacific nation, we did not utilize its destructive possibilities, so that we have had to catch up with other nations when war came. But what we accomplished in commercial aviation—second to none in the world—is an indication that the airplane is still our natural American machine. The rate at which we have progressed in military aviation under the pressure of the war danger is another proof of our national genius for aeronautics.

Now that we are really unleashing all our brain power in this domain, great things may be expected. America has the inventive impulses, the economic resources, the production talents which guarantee leadership in the air—the kind of leadership that will give us *victory through air power*, and an ampler life in a peaceful world after the victory is achieved.

## Correct Answers To Quiz On Page 78

1. True.
2. False. It is a flapping wing type, such as a bird.
3. False. A template is a type of pattern used for reproducing structural parts, etc.
4. True.
5. False. They are the names of certain fatty parts of a turtle.
6. False. Horoscopes are a type of astrological predictions.
7. False. The name is derived from the city of Oporto.
8. True.
9. True.
10. True.
11. True.
12. True.
13. True.
14. True.
15. False. It is obtained from tung trees.
16. False. Scales of this accuracy are used in weighing the filaments of electric light bulbs.
17. False. Deadwood is the term applied to certain parts of a boat's keel structure.
18. True.
19. False. The two shafts turn at different speeds.
20. False. A Pitot-static tube is a part of the air speed indicator on most airplanes.
21. True.
22. False. The pistons reciprocate in the cylinders.
23. False. This protective measure leaves it defenseless against wolves, coyotes, and bobcats.
24. True.
25. False. Porpoises are not generally dangerous to man.

*Attention, MI Readers!*

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

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Sea water contains about 50 known elements.

# Fifth Column For Ducks

[*Continued from page 120*]

comes into play here. The head should be your pride and joy. Work on it carefully with that pen knife. Get it shaped really ducky and it will please you immensely when finished. Study the photos of the Ward decoys and the drawings. When the head is finished to your satisfaction (and then some) a hole is drilled through the direct center and the head fastened on to the body with a galvanized bolt ¼" in diameter and doweled on both sides to keep the head from turning. Be sure the head merges with the body smoothly and proportionately.

Now check your decoy and wherever plastic wood can be used to fill in use it. Especially should it be used where the bolt was sunk through the head; and also around the juncture of body and head.

Now for the painting. You may scratch your head and wonder what duck your decoy is to represent. It has been proportioned to fool a Blackhead, Mallard, Canvasback or Redhead. The only way to get the correct color scheme is from accurate pictures in reliable bird books. According to the Ward brothers artist oils cut down with turpentine are best. Ducks will not decoy well to glossy blacks, etc. The best brushes to use are stiff artists' oil brushes in all sizes from 1" to the smallest liner. And the painting job can be just as good as you care to make it. It is the culminating work and the real art of making decoys. Where there is black to be painted, or brown or red, paint it on the natural wood. When applied in that manner it does not knock off as it will if first prime-coated with white.

When your decoys have been painted, and look pretty good to you, screw an eye hook in the bottom of each. To this eye hook is fastened the leader from the mushroom anchor. Mushroom anchors hold the decoys in position in very rough water. It might be well to mention that Chesapeake duck hunters get best results from decoys set out in V-shape.

During off seasons your decoys should be kept in some outhouse away from sun and rain. Store them side by side bottoms down. In addition to being used by gunners decoys make exceptionally attractive mantel pieces, or ornaments for rock gardens and fish ponds. It is very simple to make patterns for any type of game or song bird, always using the steps outlined above.

One of the things to be kept in mind is that no two ducks exactly resemble each other as to body outline, head shapes, and coloring. This very fact has caused no little trouble among duck hunters when they attempt to identify waterfowl on wing. Thus it can be seen that a decoy, if it is to lure flying ducks to stool, must nearly as possible resemble, when seen from above, the outline of a general specie; viz., decoys of Mallards, Canvasbacks, or Blackheads will usually attract any specie of duck. It is not at all necessary to make decoys of ducks which can't be taken under federal regulation—unless you want them for ornaments. Teal are seldom attracted by decoys of any kind. Most sportsmen interested in making decoys are interested only from the standpoint that they want a decoy that will bring results. The Ward brothers have had most success with decoys modeled after Blackheads. An aspiring decoy maker can do a wealth of research on ducks and thus familiarize himself with all the many different kinds. Remember that it is imperative that a decoy, seen from a duck's eye view, must appeal to that flying duck (the gunner's prospective meal) as being feather and blood brethren and sistern—or what have you! Any Tom, Dick or Harry can sit himself down on his stump and whittle himself a cumbersome object and tag it with the label "decoy," and either one of these Tom, Dick or Harry's will watch that crude object sink half way out of sight when placed on water and then cuss to high heaven when all he gets from the ducks flying on high is a faint "Quack" of derision.

Don't get the false idea you have to be an arty artist to be able to carve and paint wooden dummies of ducks successfully. Nevertheless, decoy making in its finer stages can be an art—a fine and subtle art requiring patience and a love of accomplishment. Seated in the reed-embowered duck blind, when the first faint streaks of dawn tinge the sky, and seeing bobbing upon the crest of the waters of the coves of a smooth-riding, natural appearing bunch of decoys gives real satisfaction to the heart of any man who is proud of his craftsmanship and his sport. And when the fast-flying group of ducks circle momentarily, then flare down to stool, that man in the blind gains full value for time spent in making those decoys!

"It all started with a recipe my wife had for tomato soup."

# Lillipuppets

[*Continued from page* 111]

space is storage for extra scenery or "back drops." Be sure to leave the space between the wings and the back drop open at each side. These openings are entrances and exits for the puppets, and small as they are, they need room for smooth manipulation. Remember too, that marionettes, due to vertical wires and strings, cannot go through doors or windows.

When the outer walls and the stage are fitted and glued, then comes the important matter of reinforcement. Take some plastic wood on a knife-blade and work it in to all open edges wherever you have cut the corrugated board. Push it in to a depth of at least ¼", and leave it for several hours to set. Then smooth up all the edges with sandpaper. You will now find that the exposed edges are as stiff as boards, and will take a lot of hard use without becoming dog-eared or crumpled. When making bends in the corrugated boards you have probably scored with the knife. The completed bend may be weak, so reinforce it with plastic wood. Pick the theater up and test it by working it between your hands. If it has a tendency to give too much at any point, use a little plastic wood there, and after it has set you will be surprised how sturdy your construction has become.

You will need a front curtain, and this is made of a flat piece of corrugated board slightly larger than the proscenium opening, sliding up and down in grooves made of several slips of the same material. Find a scrap of velvet or upholstery material and glue it on the front of the curtain for appearance. The side walls of the stage and the wings should be covered with some dark material. A brighter colored material may be used for the back drop.

You may build on structural ornaments to the front of the theater if desired. Something of this nature is indicated because the proscenium opening is rather small in proportion to the size of the entire theater, and such construction breaks up the blank appearance. The theater illustrated was built up with strips of corrugated board glued on in layers, so that it appears to taper in to the stage itself, and everything appears in nice proportions.

The natural corrugated board is a good neutral shade, but you may prefer to paint your theater. A 10c can of enamel from the five and ten is sufficient for three coats and a very good appearance. Further decorations were added by the use of decalcomanias and cut-out gummed silver letters, also obtained at the dime store.

The original Lillipuppet Theater cost very little. In fact the only expense up to this point was for the plastic wood, paint and decorations. About 60c covered everything. If you are willing to spend a few dollars, you can create a truly theatrical gem of a puppet playhouse.

As illustrated, the theater has footlights and toplights. Each set consists of seven flashlight bulbs mounted in the type of sockets used for radio pilotlights. In both footlights and toplights there are 3 white, 2 red and 2 blue bulbs. A small switch operates both sets of lights together, and the colors may be changed at will. The 14 bulbs, which are never all lit at one time, are powered by two large dry cells placed under the stage. Reflectors for the lights are cut from thin cardboard, the inside coated with tin-foil.

The theater also has its own orchestra—a Swiss music box unit, also mounted under the stage. This unit plays two tunes, but if you are lucky enough to get hold of a really good old fashioned music box, you might get one with six tunes, a really good musical score for your Lillipuppet Show. Only the music box unit is required. The corrugated board construction of the stage acts as an excellent sounding-board.

**CORRECTION!** The drawing above was reproduced incorrectly in last month's installment. The puppet was shown as having only four strings when actually there should be *five*.

# Skate To Fame

[*Continued from page* 150]

Here are the instructions for a typical skating dance, the Collegiate, shown in diagram on page 34:

Music—Slow Fox-Trot well accented on first and third beats. Skaters step on these beats.

The man is on the left. Partners face forward with arms (man's left, lady's right) pointed down the rink. Waltz position on corners.

This dance is skated on opposite feet. When the man is on the right foot, the lady is on the left foot, and vice versa.

The man skates inside forward edges, the lady skates outside forward cross rolls.

Notes on the Collegiate: Lady and Man must skate fairly close together shoulder to shoulder, hips close, without undue movement of the shoulders or extended arms.

Although the manufacture of roller skates will halt this summer for the duration, there is not likely to be any acute shortage for the next two or three years. In the meantime experiments are being made to create roller skates of plastic.

## Riding On Rotors

[*Continued from page* 53]

By gearing the cylindrical propeller "blades" so that their forward surfaces revolve with the relative wind as they are rotated about the central hub, Mr. Thompson has produced a propeller of altogether unusual design. A very great increase in efficiency is claimed for the new type, which would permit the use of a lower horsepower motor without reducing performance. The resultant saving in weight would actually improve the plane's performance.

In addition to this, Mr. H. T. Nelson, of Dallas, has evolved a wing with revolving center panels, the movement of which is brought about partly by natural center of pressure movement, and partly by curved edges. These edges function in a manner somewhat similar to that of the cups on an anemometer, and assist in turning the panels as the ship flies. The panels are not, however, connected to the motor. They revolve freely and independently for the aerodynamic reasons outlined, turning one to two revolutions per second.

The new wing renders a plane practically stall-proof, and in experimental tests, greatly shortened both takeoff and landing run. Hovering is also possible to a considerable extent when the ship is placed in a steep-climb attitude. Normal glides are made at about a 45 degree angle, the rotors holding down the speed. Mr. Nelson believes that the ability of this wing to bring about extremely low speed dives makes it highly adaptable to dive bombers. Moreover, when circumstances call for such a measure, the revolving panels may be locked in position to form a conventional wing—doubling the speed of the ship. On the other hand, if a seaplane equipped with this type of wing were forced down at sea, the revolving panels could be locked in a vertical position to act as makeshift sails.

"We put this in for a Mr. Preble in Gettysburg—he doesn't own a radio."

## Renewing The Porch Roof

[*Continued from page* 124]

impossible to keep the strip even and properly sloped.

Beginning at the outer edge, the matched sheathing boards were laid, like flooring, over the entire surface. In addition to the concealed nails along edges, the boards were face nailed. Eight-penny, coated box nails were used throughout.

The mica-surfaced composition roofing was rolled out flat and cut to suitable lengths. Such operations, incidentally, should be done on a warm day. Allowance was made for seams of about 3-in. overlap. You will note, in roofing specifications, that such material is to be used on roofs having a slope of at least 1½-in. to the foot. However, the roof in question, as well as most other airing decks, has considerably less slope. Nevertheless it was decided to use the material, and take special pains to provide adequate drainage and eliminate wrinkling that would cause water pockets.

And so the most important step came next. This was the cementing of the roofing to the sheathing boards. The cement was an asphaltic preparation of the type employed for laying sheet asphalt loading-platform covering and similar materials. It can be obtained from companies specializing in applying floor coverings. The cement was spread on the boards with a roofing brush, and the pieces of roofing material pressed into contact by walking on it: a linoleum roller would have been better. Overlapping seams were tarred and nailed in the usual way, and galvanized roofing nails were driven wherever a bulge or air bell appeared or threatened to appear. Fortunately, only two small spots where the cement seemed not to be holding were found; and these could have been eliminated by proper rolling, and by less haste toward the finish (caused by an approaching thunderstorm).

After the roof had been laid and the joints nailed and tarred, it was allowed to "season" for several weeks. Then a coat of aluminum paint in an asphalt carrier was applied, followed by a coat of good quality floor and deck enamel.

The roof has, so far, given excellent service, and shows no sign of failing. One improvement, however, was suggested: The board at the lower edge, where the water runs off into the spout, should have been sloped more sharply downward so the roofing, when bent over the edge and nailed, would not have created a slight bulge that forms a shallow water pocket. To prevent water from running back away from the spout and down the outside wall of the house, an L-shaped strip of galvanized sheet iron was run along the edge. The part that extends downward for about 3-in. provides a sharp drip edge that directs water into the spout. Seams on a roof of such slight slope should be run parallel to the direction of slope, and should overlap in a direction that gives protection against prevailing winds.

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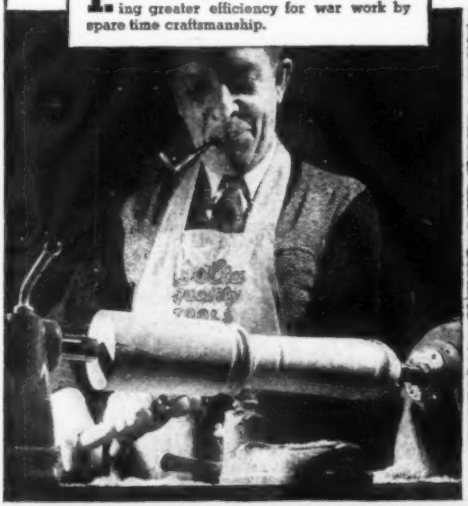
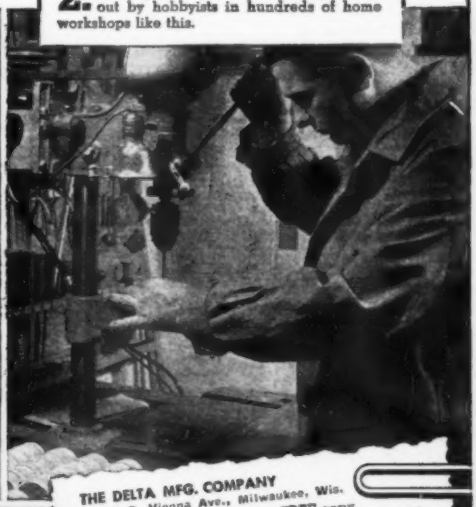


**2.** Small parts for guns are being turned out by hobbyists in hundreds of home workshops like this.



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# Light Home With Plastics

[*Continued from page* 39]

City of New York. Irwin and Edwin are two of the group of science-minded youngsters given the run of the now-closed Institute's laboratories in their spare time. (These teen-agers and their accomplishments were described in "Whiz Kids" in the January, 1942, issue of MECHANIX ILLUSTRATED.)

Part of their reward was an inspection visit to the Westinghouse Research Laboratories.

Though as high school sophomores they have yet to start their first chemistry course, Irwin's and Edwin's chemical research in their basement and in the Institute's Laboratories for two years is the basis for their hopes of developing a new plastic that will give off more light and less heat than any present material.

"This new type of plastic," they explain eagerly, "would revolutionize the lighting system of houses and business offices. Lighting costs would be cut materially, as all wiring and continued connections could be eliminated." Light could be made reflectant through the walls of the plastic —"cold lighting" could at last become a reality!

The boys began the research which now has such great potentialities by building a small injection mold and a heater out of an old tomato can. These instruments weren't very fancy, but served their purpose. Edwin and Irwin heated, bent, and treated plastic bars, at first attempting to develop one that would have greater reflectant properties for use by a physician or dentist.

Then the enterprising young scientists began to think in terms of a new substance that could be made to carry light from a central source of illumination, such as a mercury vapor lamp.

In order to be able to compare the amount of light carried by each plastic, they said, they built an odd-looking device which they call a "light transmission tester." It is about five feet long and to the unpractised eye would seem to be an unusual arrangement of an electric fan, three floodlights, three lenses, two funnels and three mutilated wooden boxes. But for the boys, the device served as the "acid test" for all plastics they studied.

Irwin explained how the tester works: "We direct 450 watts of light through three lenses to the plastic bar being examined. The light then is carried through a long bar of methyl methacrylate, or lucite, to an exposure meter, where its light transmission is registered in foot candles."

Edwin went on, "We test each plastic after we treat it and now we're compiling a chart that will compare the amount of light the different substances transmit."

Irwin said he believed that a light-reflecting plastic can be developed that will have a high enough tensile strength to be used for construction purposes and as foot rails along roads.

"I built every bit of it with my own hands—except one little place where I had to call in a regular carpenter."

# Coal Bins

[*Continued from page* 128]

The same general type of house is illustrated in Fig. 4 with somewhat different arrangement, with direct access to outside steps from the heater room.

An economical arrangement for the coal bin is under the porch, as in Fig. 5 and is especially advantageous where the house is built on a hillside so that the floor of the bin follows the slope. In the design shown the access door is placed high enough to save bending over when shoveling. A still simpler design is given in Fig. 6 where the bin is simply built outside against the house wall opposite heater room. This can be of frame construction.

Details of a basement bin constructed of plywood and adapted to Fig. 3 plan are given in Fig. 7. Panels of industrial grade plywood are nailed to conventional studding on sills anchor-bolted to a concrete curb wall. In estimating capacity, an average ton of bituminous coal occupies 40 cu. ft., or a space 2 ft. by 4 ft. by 5 ft. high, and the bin should be proportioned accordingly.

# Ideas For Service Men

[*Continued from page* 131]

stating that someone is very ill. They never check up on such things—*not MUCH!*

8. If things don't go to suit you, just hunt up the Chaplain and get him to arrange special privileges for you—Ah! how popular you'll be from then on! "Holy Joe's Boy" they'll call you.
9. If you don't like the way this navy is run, write to your Congressman, or to the Bureau of Navigation. Action? You'll get it—and HOW!
10. When you go ashore or make a liberty, come back with a half pint smuggled in your sock or under your jumper. The old Chief at the gate isn't wise to anything like that—he's only put in 30 years or so before you came. And start a crap game whenever pay day comes round—the exercise you'll get scrubbing a few acres of parade ground pavement will put hair on your chest!

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# Design For Docking

[*Continued from page* 135]

pressure treated woods is almost impossible because of the amount of handling necessary in making up the crib; painting each crib as completed and just before submerging is the more practical. In locations where marine borers infest the waters, sheathe the four corner posts of each crib from the water line down with sheet copper, zinc, or galvanized iron in this order of preference.

Each crib is merely a large slatted box to hold stones, and is made up ashore after you've prodded around with a long sounding pole to determine depths and the slope of the bottom at each crib location. Corner uprights are cut for a crib in accordance with these soundings. The lower ends are left a couple of feet longer than necessary and pointed to let them dig into any silt over the rocks and so help keep the crib in place until filled. Stringers and clamps holding the heads of the posts are not fitted until later. No general rule as to size can be laid down except that the larger the area of the crib the greater its holding power. Corner or end cribs for the average dock will run 5 ft. square with intermediate or side cribs 3x5 ft.

The partially completed crib, preferably an end or a corner one, is floated to its correct position, upended to float erect, then enough rocks dropped in to offset its flotation. It can then be spotted accurately and more rocks dropped in to sink it into place. Every effort must be made to keep uprights plumb, corner posts being tapped firmly with a maul to do this. More rocks are dropped in, then lines stretched to stakes ashore—and to stakes out in the water if other corner cribs are required, to aid in locating them. Cribs inshore will naturally require shorter corner posts. When all cribs are in, temporary braces are nailed from one to another and filling completed. These braces are left on until all crib uprights have been sawn off to the same level at dock or boathouse floor height. Crosspieces can then be left into their heads and long stringers fastened atop these to connect the cribs and take boards of the dock or floor of a boathouse.

Piling will afford sufficient support for either a dock or boathouse if you are fortunate enough to be building over a sand or mud bottom. Here the weight of the piling made necessary by the size of the project may determine the method of driving. The simplest type of deep water dock may have light pine poles mauled or "jiggled" in, pairs connected with crosspieces, perhaps braced by diagonals for stiffness, then connected with stringers and boarded over. At the other extreme where the dock is of some size and one wants it to last a number of years heavy piling must be put in by a piledriver or jetted down. A commercial piledriving outfit will charge around $10 and upwards per pile, pile supplied, according to the locality but as the piles are on the large side, 8 in. or more in diameter, they can be widely spaced if heavy timbers will be used for the upperworks of the structure. If one must handle sizeable piling shorthanded, jetting in with water is a practical way. A hose from the house ashore or water supplied from a hand force pump located on a scow or heavy skiff can be used as a constant stream rather than intermittent pressure is required. The principle is to lash a piece of pipe alongside the pile to be driven, so that its lower end is an inch or so below the point of the pile (see sketch). A hose is slipped over the upper end and water forced in while the pile drops down. When it is at the desired depth, or strikes hard bottom, the pipe is pulled out of its rough lashing and made fast alongside the next pile to be driven. Mud or sand soon fills back in again about the driven pile to hold it firmly in place.

Commercial fishermen "jingle" or churn down their heavy net stakes, and this method can be used to sink even sizeable dock piling into a sand or mud bottom. Working from the shore out, and from the dock itself which is roughly completed as driving proceeds, the pile is upended and temporarily supported by hand or with poles running out from it. A crossbar or pole is slipped through a loop of chain about the pile in such a way that it clamps both tightly together. One man steadies the end of this pole while two others mount it, to stamp or force it down with their weight while the man at the end of the pole shifts it back and forth. As long as the pile is kept going it drops down at a good rate; if you stop stamping and shifting it though, it can't be started again. It's a bathing suit proposition until you've gained experience.

If a boathouse is to be built on or alongside the dock, construction will follow regular

[*Continued on page* 170]

"He sees water below!"

# No More Gas

[*Continued from page* 101]

a look at the carburetor on your car, however, you'll see that it's fastened on to the exhaust manifold. This keeps it warm even though it's intended to use gasoline.

If you want to use kerosene in the same carburetor, you also take advantage of the heat in the exhaust manifold. Assuming that you hang some sort of a tank under the hood so as to have a gravity feed on the kerosene, the rest is a cinch. You run your kerosene line (which should be copper tubing) from the tank down to the exhaust manifold. Try it first with just a single line of the copper tubing running along the top of the manifold. The excess tubing (and there should be some) can be left in the form of a few idiotic zig-zags at one end of the manifold. Also provide some sort of a tin or sheet-metal intake-air-heater for the carburetor. The exhaust pipe can provide the heat for this too, but keep exhaust sparks out—no exhaust leaks.

In addition to the copper tubing, you'll need two petcocks, some miscellaneous fittings, and a tee connection. The tee is screwed into the carburetor, and one petcock screwed to each side of it. One of these is in the gas line and the other is the kerosene line. These are necessary because you have to start the engine on gasoline, with the kerosene shut off. When the manifold gets hot and heats up the kerosene and intake air, you shut off the gas and switch on the hot kerosene line. If all is well at this point, with the engine idling, you shouldn't notice much difference. If all's not well it'll probably run unevenly, smell up and smoke up the whole neighborhood. Then you unbend the idiotic zig-zags of tubing at the front of the manifold, and bend them back to lie along the top of the manifold to provide more surface for the transfer of heat to the kerosene. But the kerosene shouldn't be hotter than 100° when it enters the carburetor.

If your car is the ultra-high compression type, it may be necessary to add a sheet metal "shim" gasket on the top of the block in addition to the regular head gasket. If so, the shim gasket should be about as thick as the regular one.

With the kerosene conversion properly installed, you'll be able to re-start the motor (if it's still warm) without switching back to gasoline. If you plan to stop for any length of time, however, it's wise to switch back to gas before you stop. Be sure to keep the engine running long enough after switching to gas to enable it to use up the kerosene in the carburetor, and allow it to refill with gasoline. Otherwise you'll have to drain out the carburetor with both lines shut off, and then allow it to refill from the gas line.


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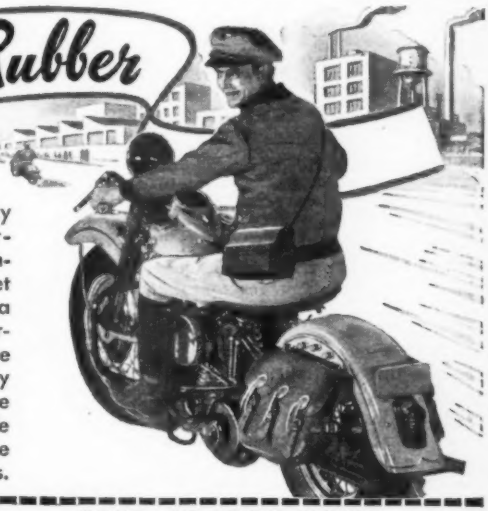

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## How To Shoot Guerrilla-Style

[*Continued from page* 71]

the gun as in shooting it. And the so-called practical shot who possesses reasonable facility at both the quick draw and speed shooting could kill three or four target experts before they had their sights aligned. The component actions of getting the gun into firing position are fully as important in combat as in shooting the gun afterwards.

In quick drawing there are many methods, some of them being actual juggling, though the hip draw from a belt holster is the simplest and most easily learned. It is also as fast as any other with adequate practice and as shown, allows the gun to be lifted up and out in straight line toward the target so an accurate shot can be fired from the instant it is levelled.

One of the first requirements necessary to both quick-drawing and speed shooting is that the grip be standardized, that it remain the same from the first time the gun butt is grasped on through the follow-up movements into various shooting positions until firing has ceased. This is necessary so that point shooting results will be the same each time and so that the gun will not shift in the hand because of recoil. The proper grip is a sort of lock grip in which the thumb and second finger "strangle" the neck of the gun butt to lock it against movement. The side pressure of the thumb compensates for opposite pressure of the trigger finger to eliminate side wobble in rapid firing. A small amount of practice will enable one to achieve this grip every time with the sense of feel alone telling when it is wrong.

In quick drawing, however, this grip is not taken all at once though the time necessary for its completion may be as little as one-fifth of a second in expert hands. Instead, as the hand is brought up from the side it passes over the gun butt in a circular motion, drops down behind, and picks up the gun en route to the shooting position. This circular detour is necessary and is much faster than bringing the hand to the gun stopping to grasp the gun and starting up again, simply because human reaction time in performing three distinct operations instead of one would add from three-tenths to three-fifths second to draw. It is the principle of the circular racetrack, the last three fingers hooking the gun from the holster on the way up. The fingers tighten en route, the thumb slips into place and tightens, and the forefinger lays across the trigger so that by the time the gun has reached the point shooting position shown the grip and the quick-draw are both completed.

This point shooting position, since it is that most quickly reached by the levelled gun, is of course the fastest. But accuracy in using it depends entirely upon the extent to which the shooter has acquired a sense of direction or "feel" in the alignment of his gun barrel with the target. This is gained only through practice and is the basis

[*Continued on page* 171]

## Design For Docking

[*Continued from page* 168]

summer cottage building procedure. Where a drive-in type design is used framing about the door should be well braced with diagonals to help keep the wings from shifting their positions. An effort should be made to have the finish either pleasingly rustic to blend in with the shore-line or the structure a type to match construction of any house ashore. Log siding looks well, wood or composition shingles stand up indefinitely, and exterior plywood is light weight and easily laid. There is no limit as to what can be worked into such a structure: often a shower and lockers are provided for bathers' use; the roof may be flat and railed to form a sun deck; or accommodation may be provided to house overnight guests. At the same time one must not lose track of the main object of the building—to shelter your boat during the summer months, and to provide winter storage for her the balance of the year, with features added to simplify spring fitting out, which can be done inside the boathouse independent of chancy spring weather. The simplest boathouse can have its lockers for storing paints and equipment, and enough ample sized windows keep weight of side walls down and provide light and air for painting and working. Both electrical and hand operated lifts for hoisting the boat clear of the water can be secured at reasonable cost; either type will save its cost over a period of several seasons in sections where heavy ice makes hauling out for the winter necessary. The door of a drive-in boathouse should be a type that can be opened easily from outside—perhaps the rolling garage doors now obtainable as a stock proposition. A lifting chain can then be led out to a post or bar extending from the dock cribbing to permit opening the door without getting out of the boat.

Even the simplest dock should be finished up to be as convenient as possible. Ample fenders or chafing gear should be provided to avoid damage to boats alongside: used fire hose, heavy rope, or old floor mops nailed to surfaces the boat's apt to touch, serve well. Steps, or even a ladder leading down to the water make it easier to reach small boats and for bathers to get up on the dock. Rollers fitted in the end of a low dock enable a man to haul a small boat or canoe out singlehanded. A ring buoy and a long boat hook held in proper chocks are worthwhile safety equipment on any dock. A spring or diving board will be appreciated for the bathing bound to be done off it; and even the smallest dock will take an open summerhouse or shelter over or alongside its end for those who'd rather watch than sail.

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About 33,000 tons of cattle feed will be produced in Florida in the 1941-42 season from 350,000 tons of raw waste in fruit.

---

About 10% of the maple products consumed in the United States come from Canada.

## How To Shoot Guerrilla-Style

[*Continued from page* 170]

for the so-called hip shooting about which we have all read. The combination makes a deadly split-second combat shooting method within the limits of its ten to twenty-yard range, accurate distance being entirely dependent upon the skill the shooter has aquired by practice. Many experts can draw and hit in a quarter second—about the time it takes to blink twice.

Where the range extends over fifty yards and on up to the 200-yard limits of a modern handgun two hands will be found necessary in shooting to achieve the steadiness needed for the comparatively greater accuracy. This is a trick from the hunting fields which may be used in practically any position with no loss of time. As illustrated the gun butt held in the right hand is merely set down hard into the palm of the upheld left hand, the opposing tension giving the same support as though it had been set upon a log. And there is no hindrance to pivoting from the hips.

In drawing the gun the left hand is merely raised palm up simultaneously with the right and is brought against the gun butt just an instant before the sights are caught and aligned.

In all of these combat maneuvers, however, sighting is a major factor. In arriving at some compromise between extreme speed and extreme accuracy without a too appreciable loss of the latter, sighting must be standardized so that the shooter will quickly become familiar with his sight image when properly aligned. In time this sight image will become impressed upon his subconscious mind to which eventually will be relegated the sighting job without conscious effort. This in turn will speed up the process of shooting to an amazing degree. Once again practice is the secret.

In combat shooting there are many maneuvers such as the kneeling and prone positions illustrated which help in solving the two problems of shooting first and fast and of being as inconspicuous a target as possible while doing so. Personal ingenuity and exigencies of circumstance will suggest others. But only practice will make any of us efficient protectors of our democracy should the need ever arise. We hope "it can't happen here." Let all of us who are not pursuing our common war upon a far battlefront be sure that it doesn't.

## Photo Salon—At Home

[*Continued from page* 93]

professional photographer friend. In his studio, he has long rows of prints on the walls of offices and corridors. Two horizontal, parallel strips of wood are fastened to the wall about 17 inches apart. These strips are one-inch wide by one-half inch thick, and as long as you care to make them. One-half the thickness, to a depth of one quar-

[*Continued on page* 172]


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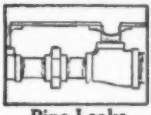
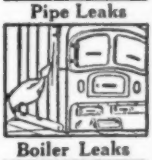
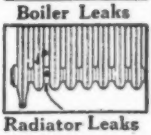


Pipe Leaks



Boiler Leaks



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## Photo Salon—At Home

[*Continued from page* 171]

ter of an inch, is cut from the top inner side of the lower strip. The bottom inner side of the top strip is similarly cut except the cut is made one half an inch deep. The strips are nailed on the wall with small finishing nails. The space between them is regulated by the height of your mounted prints.

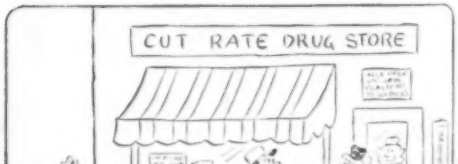
I use 14 by 17 inch mounts. Window glass of the same size is used to cover the mounts. The strips may be obtained from and sawed by any lumber yard for a few cents. Paint them an appropriate color before putting them up.

The actual space between the strips, measuring from the top of the lower strip to the bottom of the top strip, should be just five-eighths of an inch less than the height of your mounts. To place the mounts and glass between the strips, place the glass over the mount, and slip the top edge of mount and glass under the top strip and then allow them to slip down in the groove in the lower strip. The grooves in the two strips hold the picture and glass firmly and flat against the wall.

The prints may be put up or taken down in a moment's time, and because of this, I am able to change my exhibit every time I make a new batch of prints—or when I grow tired of one print, I simply slip it out and insert another. In this way, the exhibit always has new prints in it.

The idea has worked beautifully. For some reason, it is easier to see faults in prints when they are mounted on the wall and I can view my prints with a more critical, detached point of view. Unless I am thoroughly satisfied with a picture, it is not honored by being hung very long.

What is more important, I do not bore my friends by making them look at my work! The pictures I want them to see are on the wall. It is for them to decide whether they want to look at them or not. You will be surprised, however, how much interest your pictures, thus displayed, command.




"If your nickel isn't down this crack, lady, I'm afraid I'll have to give it up and get back on the job!"

## Wooden Water Tank

[*Continued from page* 137]

a flow of water from one end of the tank to the other when the boat rolls or pitches, a condition which will otherwise put a great strain on the fastenings. Corner battens make for stronger construction where the size of the tank warrants; and screw fastenings will, of course, have to be bored for, especially at the ends of boards, to avoid wood splitting.

With all but the top fastened together, and with the outlet connection fitted, melt common paraffin and paint the entire inside, especially over joints, doing the work preferably on a hot day or in a heated room and having the stove over which the wax is heated right beside the job.

Next fit the fill connection in the top, then paint top edge of tank all around with liquid marine glue and fasten in place.

In installing the tank fit enough crossbeams or bearers beneath so that much of the weight of the contents will come on them rather than on the bottom fastenings.

## Modernize Your Bathtub

[*Continued from page* 129]

with small nails. Install the strip at the back for panel No. 1 first. Then across the ends for panels 2 and 3. Short pieces of end strip must be used at the ends of panel No. 1 where they fit against panels 2 and 3. These pieces are not nailed but just slipped on to cover the raw edges. Panels 2 and 3 are then pushed in place. The corner strip along the front is then installed. This holds panels 2 and 3 in place. This strip can only be nailed in the edge that hangs down.

Panel No. 4 must be removable in case it is necessary at any time to work on the plumbing. This is easily accomplished. End strip is cut to fit the ends of the panel from the baseboard up. These are just slipped on and are not fastened. The panel is then fitted into its groove in the corner strip at the top and pushed in at the bottom. A piece of quarter round at the bottom holds the lower edge firmly in place. Screws should be used in putting down this quarter round so it can be taken up without trouble. These screws should go straight back into the frame.

The cabinet is mounted with two small hinges. It has a snap catch mounted in a block on the inside of the door. The handle screws also are turned into this block. The door opened in a panel 4 is bound with end strip. No strip is used on the door.

In cutting the curves on the top panels it is best to make a pattern with cardboard, cutting a little at a time until you get a good fit. This will eliminate mistakes. The tile board is best cut with a fine tooth saw. Tile board comes in several colors, either plain or scored off in squares like real tile. Tile and binding strip can be obtained at mail order houses or your local lumber dealer's.

## Dynamic Patterns By "Overprinting"

[*Continued from page* 100]

wasn't there to begin with, thereby saving the shot.

Look over your negative file and see how many of your earlier shots look as if they might be improved by this sort of treatment. Are there busy, detailed areas that would look better suppressed, and bold masses that look as if they could dominate the scene if properly accented by contrast with the background? The only way to determine the potentialities of any negative, of course, is to put it to the practical test.

Prolong the exposure on normal paper. Try a harder grade of paper, too, and see if the effect is pleasing. In many cases, the difference between your earlier, normal print and your dramatic effect achieved by overprinting is so marked that it looks as if they were printed from two entirely different negatives. The degree of overprinting might be varied, too, to excellent advantage.

In dabbling with this technique, make it a point to keep your print developer temperature constant and to develop for the optimum time recommended by the paper manufacturer. Prolonging development excessively will gray the white areas of the print no matter what the exposure; shortening development, even when exposure is prolonged, produces unconvincing gray blacks, lacking the very richness that we hope to achieve by overprinting.

## Just Bugs!

[*Continued from page* 94]

there is no negative involved, there can be no graininess, regardless of the size of the enlargement.

Insects with transparent, lacy wings and long, curved feelers are ideal for enlarging. Other translucent varieties will permit light to pass through them and record some of their internal organs in X-ray fashion.

For opaque insects with lacy wings a hard grade of paper will serve best, while with translucent bugs, a softer grade of paper will help record the delicate middle tones of the internal organs.

One of the best places to find a variety of insects in a perfect state of discontinued animation is in the bowl of home lighting fixtures, where many of them come to a final resting place after batting their brains out against the light. Live insects can be prepared for enlargement by placing them in a covered glass jar next to a thimble containing a drop of carbon tetrachloride. One whiff of the tetrachloride fumes and Mr. Bug becomes a photogenic cadaver, ready for the enlarger and immortalization via photography.

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## Recipe For A Baked Plane

[*Continued from page 77*]

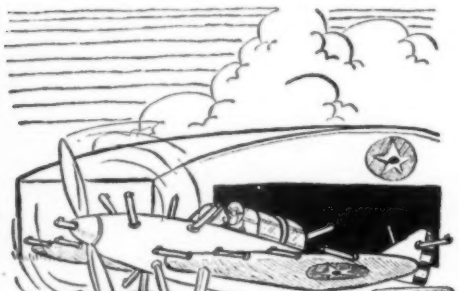
the layers are completely impregnated. The plastic material is made of three primary ingredients, resulting in a liquid phenol formaldehyde resin similar to bakelite. The three ingredients incorporate several chemical compounds and are mixed in an ordinary mixing machine. One of the ingredients is a powder, the other two, liquids.

The fuselage sections which have been formed roughly with plywood layers, then sprayed with the plastic, are next pressure-moulded. The fuselage half-skins are slipped into place on the formers and bulkheads in a simple operation. Joints are secured by the rapid setting action of the phenolic resin. These fuselage skins are extremely light, yet strong, and are formed at a fraction of usual costs. The combination of plywood (used for rigidity and strength) and the phenolic plastic is a new substance which provides the desirable features of both wood and plastic.

While the fuselage has been a-making, the tail surfaces and the single wing have been moulded to precise dimensions so that, after baking, they can be simply lifted into their positions and fastened.

But the baking—the crux of the recipe! Well, a complete airplane is baked in the special chamber that is the oven. Sprayed again with the liquid plastic, the fuselage and other component parts are wheeled into the oven, and subjected to controlled humidity heat. Under that temperature's influence, the impregnated plywood, the plastic binder between the plywood surfaces, plastic material at all joints, and the outer coating of plastic on all exposed surfaces fuse into one

[*Continued on page 175*]



"Don't you think Lieut. Watkins is overdoing it?"

## "Checquer" Files

[*Continued from page 138*]

shop worker and the master mechanic—and jobs formerly difficult become as simple as rolling off a log.

Fig. 2 shows some stippling punches for use on wood, leather or metal, made with these parallel grooving files. Three or four strokes with the file cut the teeth so cleanly that they are easily finished to sharp points or edges with a sharp 3-square file. (By the way, the best steel for such punches is that used by lettering-die makers, and known as "Firth Sterling"; it cuts easily, is water hardening, is tempered for hard service at light straw color, and never chips or cracks in use.)

These stippling punches are essential for background work in wood carving, leather work, silver and other decorative sheet metal work, and by gunmakers for producing a finely matted surface on shotgun ribs, sight ramps, tops of rifle receivers, etc., and for roughening the finger surface on triggers of target arms.

When making up special rifflers (curved files), floats, purfling cutters (inlaid borders, etc.), gunstock checking tools, etc., the teeth are quickly and accurately spaced off by means of a few strokes from such a file, to be afterward finished to shape with a fine 3-square die-sinker's file (Fig. 3).

Small tools used in the hand, such as linoleum cutters, carving "shovels" and checking tools, are improved by having their upper surface scored with parallel or cross-hatch lines by means of the checquer file (Fig. 4).

Flat surfaces on firearms, such as top surface of receiver or edge of sight ramp, may also be either square or diamond-checked with an accuracy equal to knurling; or receiver tops either checked or scored with parallel lines; or shotgun ribs matted with finely spaced cross lines or diamond checking; and a small circular area on the rifle bolt-knob, sharply checked, greatly improves its appearance and handling qualities. These are sketched in Fig. 5.

The more one experiments with these files, the more useful and fascinating possibilities develop in every phase of shop-craft.—*Clyde Baker.*

## Make Yourself A Ring Clamp

[*Continued from page 138*]

Lignum Vitae, Cocoabola, Ebony, Rosewood, Hickory, or Rock Maple, in the order named.

All parts should be hardened at bright cherry red, then drawn in lead bath to dark straw color. The springs are of about 1/64" music wire, and are wound on 1/32" drill-rod, to give a finished spring diameter of about 1/16". These springs may be omitted if desired; but if used, will greatly increase the general handiness of the tool.

For holding small screws, pins, and other small parts, for filing, grinding to length, etc., there is no tool in any shop which can equal this.—*C. B*

## Recipe For A Baked Plane

[*Continued from page* 174]

rigid whole. In doing so they form a new material which is accepted by both the aviation and plastic industries as a true plastic material.

From the bake oven the complete parts, evenly contoured and marvelously smooth and streamlined, are rolled to the final-assembly hangar.

In addition to the advantageous properties (such as light weight, strength) suggested above, the material in the Timm plane is remarkably fire-resistant. In the test shown in the photo on page 77, a piece of the plastic and one of dural, the metal alloy now most commonly used for plane fuselages and wings, were simultaneously subjected to 1,800° of heat from an oxy-acetylene torch. The dural burned through almost instantaneously, and showed a tendency to fuse and to support combustion while subjected to the heat. But the plastic material of the Timm plane did not burn through at any time although the outside layer of plastic charred.

This test has particular interest for the aircraft industry, since one of its greatest obstacles has been the fact it is practically impossible to build a fire-resistant structure with materials in current use.

The plastic also has proved to be far more resistant to shock than dural, as another illuminating test showed. An 11-lb. metal ball was dropped seven feet on each. The ball striking the plastic bounced harmlessly, but when it struck the aircraft dural, the metal bent deeply under the ball's weight and momentum.

## Baling Wire Navy

[*Continued from page* 67]

the Associated Speedboat Clubs of Southern California, has established a "duration policy" in which drivers agree to race for paper certificates instead of trophies or cash awards. Trophy fund and all gate receipts, should an admission be charged, are turned over either to the Red Cross or to a war charity. Service men are admitted to all regattas free of charge.

Motor and hull experts believe that the back yard inventions which drivers "dream up" in order to keep their potent outfits at a racing pitch, are not only inspiring another proving ground for mechanical ideas, but they will breed a much higher quota of top-flight drivers and motor wizards when normalcy comes round again.

There is more truth than poetry in the facetious words of one well-known western speedboat technician:

"We've darned near reached the point where we'll have to turn the piston rings inside out and use the other side. Whatever we break, though, we are going to repair. Where there's a war, there's a way."

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# Mess Call

[*Continued from page 74*]

before that, as indicated in the following pungent extracts from "Camp Fires and Camp Cooking," by Captain James M. Sanderson, (C. S. Vols., Washington, Government Printing Office, 1862).

### KITCHEN PHILOSOPHY

"Remember that beans, badly boiled, kill more than bullets; and fat is more fatal than powder. In cooking more than anything else in the world, always make haste slowly. One hour too much is vastly better than five minutes too little, with rare exceptions. A big fire scorches your soup, burns your face, and crisps your temper. Skim, simmer, and scour, are the true secrets of good cooking."

### THE COOK'S CREED

"Cleanliness is next to godliness, both in persons and kettles: be ever industrious, then, in scouring your pots. Much elbow grease, a few ashes, and a little water, are capital aids to the careful cook. Dirt and grease betray the poor cook, and destroy the poor soldier; whilst health, content, and good cheer should ever reward him who does his duty and keeps his kettles clean. In military life, punctuality is not only a duty, but a necessity, and the cook should always endeavor to be exact in time. Be sparing with sugar and salt, as a deficiency can be better remedied than an overplus."

When Napoleon's mighty shadow moved across the map of Europe, boundaries shifted like sands before his marching armies. Yet not one of these victories altered the course of human life as deeply as Napoleon's interest in the preservation of foods for his soldiers! Napoleon said, "An army marches on its stomach. Our greatest enemy is not England, Austria or Italy. It is scurvy. Our men are dying of slow starvation."

Forthwith the great general caused a reward of 12,000 francs to be offered the patriot who could find a satisfactory way to keep food fresh and wholesome over long periods.

It was the great Louis Pasteur, some years later, who discovered that by subjecting the food to sufficient heat before it was canned, bacteria could be destroyed and food safely preserved, and it was not long after the War of 1812 that the new art of keeping food was brought to America.

All discoveries, all scientific developments down through every age since have been scrutinized by Uncle Sam. His "Army Cook" has been revised up to date to fit changing food habits. The first half of the book is a text on foods and equipment. It defines cookery terms and gives many hints for success in preparing such things as brown gravy, coffee, dehydrated vegetables and breads. It explains the use of field kitchens and

[*Continued on page 177*]

# Model Plane Catapult

[*Continued from page 143*]

with screws. At the rear and center of the bottom of the main plank a one-half-inch screw eyelet must be inserted to hold the loops of rubber which are attached to the cord. This cord connects to an eyelet screw at the front of the car which carries the model. The front two pulleys can be from about ¾" to 1½" in diameter and must work freely. Just a few inches behind the pulleys several loops of about ⅛" rubber are stretched from two eyelet screws. It would be well to use screws or bolts that could be bolted from the outside as these rubber bands act as a shock absorber for the car.

## The Car

As the pieces are already cut to proper size, the car which carries the model will be relatively easy to build. With the top and sides assembled, the two blocks against which the landing wheels rest and the rear post which supports the tail are easily cut from a 1½"x¾"x12" piece of wood. These blocks can be made to slide along the "T-shaped" pieces as indicated to accommodate various landing gear widths and fuselage lengths.

A piece of eight-inch piano wire bent to fit the approximate shape shown in the plans will work satisfactorily as the release lever. This heavy wire release lever is attached to the wood dowel by means of eyelet screws and goes through a small hole on the side of the catapult. Fasten the two pulleys in the locations indicated and rig up cord and rubber strands.

Before launching your model from the catapult be sure that there are no obstructions in the way and that there is sufficient space for the craft to fly around in after it gets into the air. The landing wheels of your monoplane or biplane are placed in front of the wheel blocks. Next the tail is lowered and the tail skid is placed into the notch in the rear tail supporting post. The notch will hold the model firmly enough while the motor is set at full throttle. With the engine running wide open for maximum thrust, with a gentle pull on the release lever, your model rockets forward into the air. It's a real thrill to see her zoom skywards. Should your model not climb enough after leaving the catapult you have two alternatives: Either add more rubber for greater power or raise the front end of the catapult by adjusting legs.

### ANSWERS TO QUIZ ON PAGE 141

1—A board foot is equal to 1 in. thickness; 1 foot width; 1 foot length. Hence, 3 board feet.
2—Steel wool.
3—"B" is a resistor. "A" and "C" are condensers.
4—A spoke shave. B—drawknife.
5—Animal glue because of its strength and non-staining qualities.
6—1 is formula for DC voltage; 2 is formula for AC inductive reactance.

## Mess Call

[*Continued from page 176*]

tells how to install and use the field ranges and bake ovens.

The rest of the book is recipes—from breakfast to beverages—and all in quantities to feed one hundred men.

Due to the greatly increased pressure of wartime work, and also to take advantage of the best minds on the subject, for the 1942 revision of the cook book, the Quartermaster Corps for the first time has turned to civilians for advice and assistance. All recipes will be tested in laboratories of ten leading commercial plants, representing all branches of the food industry and located at strategic points throughout the country. Interestingly enough, women home economics experts reign in the plants called on for this special duty.

When it comes to really getting down to tests however, it seems that the army not only examines the food, but also tests the men when they have the food inside them. It's "boots, boots, boots marching on again"—and on and on, for soldiers from Fort Snelling who have been volunteering to march on a tread mill where the energy they expend can be measured. This is in connection with some valuable studies on special rations being carried on by Dr. Ansel Keys and associates of the University of Minnesota.

The soldiers being tested, work, eat and sleep in humidity and temperature controlled rooms where any climate from the jungles of the South Pacific to the icy wastes of Alaska, can be simulated.

When this experiment is over, Uncle Sam will know:

1. Whether or not his army could eat and subsist on the rations exclusively for periods of 24 to 48 hours.

2. Whether the rations will maintain blood sugar level and protect the body under field service.

3. How much water men living on such rations would need.

4. Which combinations of ration materials are most readily eaten.

5. What complications, if any, might be expected from the food with regard to headaches and the nervous system.

In another test, a 100-mile hike across the hot desert sands of New Mexico was completed by a 14-man expedition for the purpose of seeing how they stood up eating a new type emergency ration.

Designed for emergency use by Air Corps personnel who might be forced down at points where they would have to hike a great distance, this ration is packed in three containers with an average weight of 12½ ounces a meal.

What would such meals consist of?

Pemmican biscuit is the mainstay for each meal, but for each meal you would also have two graham

[*Continued on page 178*]

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# Mess Call

[*Continued from page* 177]

crackers and a stick of chewing gum. You'd find soluble coffee with sugar in your pack, also malted milk tablets, several tins of meat, bouillon paste in a tube, some dextrose tablets, chocolate fudge and tablets for making lemonade.

Living on this food and hiking in the desert, the soldiers were accompanied by an Army truck carrying laboratory equipment and an extra water supply. Each hiker carried a 25-pound pack, including two blankets, mess kit and three days or emergency rations. The men were weighed each morning and night and given other tests en route.

To test the keeping qualities of dehydrated foods, devised especially for long distance shipments to troops in insular possessions, experimental shipments are made to the Philippines and the Panama Canal. After they have been kept there nine months, the foods are returned to the United States for examination. If they are still in good condition, the experts know they'll keep anywhere, because of the heat and humidity in those places.

Even food as good as the Army insists on buying, could, of course, be ruined by poor cooks. To see that it isn't—to keep the American Army the best fed in the world—each of the Army's nine Corps Areas maintains Bakers and Cooks Schools, usually one principal school to each Corps Area, and a number of branch schools.

The Commandant in each case is an especially trained officer and as an example of a typical training setup, in the First Corps Area, 48 men serve on the permanent staff and enlisted men are brought in for a course that lasts two months.

This course of study includes: nutrition and mess management, theory and practice of cooking, theory and practice of baking, recipes, practice in field rations, and care of field cooking equipment.

A student spends a day in the classroom; the next day he goes to the kitchen and puts what he learned into the cooking pot, so to speak. By the time he graduates, a student cook is familiar not only with recipes and nutrition but he also knows how to cut meat, operate a field kitchen, and how to keep accounts.

A student baker knows how to classify and grade flour, how to mix and prove dough—and perhaps how to bake when his ovens are in a muddy gulch such as those in Bataan.

In 1941, the goal for the Quartermaster Corps was to train 68,000 cooks and 7,000 bakers. With a larger army and on a war basis, the number will be augmented, for one cook is desired for about each fifty men.

"What is the most popular recipe in the Army Cook?" we asked.

"There is no one which outranks all others," was the reply; "favorites that have strong followings are vegetable soup, braised beef, baked beans, steak, and apple pie, and cinnamon rolls."

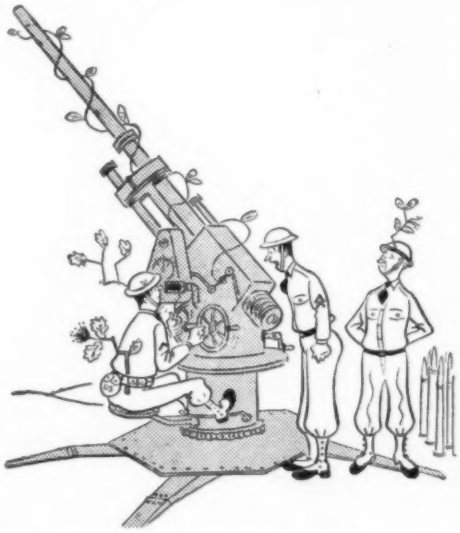
It's more or less acknowledged that soldiers grouse about army fare—but mostly that's just tradition, although Uncle Sam's experts concede that you may hear individual complaints and cite several possible reasons. The boy may be homesick and have no appetite. He will not admit he is homesick and tells you it is a poor mess. He may be accustomed to having his mother give him a poached egg on toast while he reads the morning paper. In the Army he will get his eggs and toast, but he puts the egg on the toast himself if he wants it there.

The average young man starting service in the United States Army is 5 feet 8 inches tall, weighs 144 pounds, has a chest measurement of 33¼ inches, a 31-inch waistline, wears a 9½-D shoe and a size 7 hat, according to figures compiled by the War Department.

After a few months in the Army, the recruit gains in weight on Army food, wears shoes one-half size larger and has an expanded chest measurement.

No, "dear Mom" really need not worry in so far as Johnny and her apple pies are concerned—not while the army cook "does his duty and keeps his kettles clean."

Mom may even be disconcerted to hear her son say judiciously, of her family-recipe pie, ". . . doesn't taste quite as good as the Army's . . .!"



"Don't be like that, Hogan. Let Peterson ride around for a while now."